

BRINGING ARTIFICIAL INTELLIGENCE CLOSER TO PEOPLE

Handbook for Trainers of Artificial Intelligence



Erasmus+ project

AI Curriculum: AI in Adult Education

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CLARIFICATION OF TERMINOLOGY: The simultaneous use of male and female forms of speech has been avoided for reasons of better readability. All personal designations are equally applicable to both genders.

A man with curly hair and a beard is sitting outdoors, reading a book. He is wearing a dark t-shirt and jeans. The background is a blurred natural setting with trees and foliage. The overall tone is calm and focused.

CHAPTER

1

HOW TO USE THIS HANDBOOK?

Artificial intelligence (AI) is one of the most important technological advancements of the modern era. It has impacted the way people think, learn, and work in a variety of fields, including the banking, healthcare, and education sectors. What's more fascinating is that AI has a greater influence on our daily lives than we realise. We need to be able to recognise AI and its impact on people and systems, its drawbacks and ethical dilemmas, as well as be proactive as a user of AI.

Rapid changes and developments in technology are particularly affecting workers with lower educational levels, who now need to get used to working with AI. They need to know what AI is, how it works and how to use it in their personal and professional lives. Using AI requires skills and values which extend far beyond simply knowing about coding and technology.

This handbook is designed for trainers, teachers, and other people who would like to know more about AI as well as transfer the knowledge in innovative ways to people, who are not so familiar with the topic of AI and those whose professional and everyday life is affected by AI.

The purpose of the handbook is to empower, inspire, motivate and increase trainers' self-confidence, in order for them to be better prepared when training learners in the challenging but also rewarding AI field. The handbook offers a theoretical background on AI, as well as ideas and concrete tools that a trainer can use for training or for self-development as a trainer. The tools are immediately transferable to practise, and can also serve as a basis for upskilling.

The handbook is designed in accordance with Level 3 of the European Qualifications Framework (EQF). At this level, learners are expected to acquire knowledge of facts, principles, processes and general concepts in the field of AI. With the support of the hand, learners shall be able to gain a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information. Furthermore, learners can also take responsibility for completion of tasks and adapt their own behaviour to circumstances in solving problems.

In **Chapter 2** the role of the trainer, the competencies that he or she must possess, what expectations the trainer should have, and the most important characteristics and traits of a trainer in order for a training to be successful are presented. We also place emphasis in the virtual environment and thus present what the trainer should pay attention to when working in the classroom or working in a virtual setting.

Chapter 3 provides a detailed description of the implementation of various energisers and training methods that can be used in different trainings, especially training about AI. Some of the described methods are also used in the AI training examples given in Chapters 4 to 6, for the reader to have an example of how to use specific methods in practice. You will find a detailed description of how to perform icebreakers, various training methods, and guidelines for discussion.

Chapters 4, 5, and 6 provide insight into three main areas of artificial intelligence:

- *MACHINE LEARNING & HUMAN MACHINE INTERACTION,*
- *AI TECHNOLOGIES AND APPLICATION FIELDS,*
- *AI PERCEPTIONS, ETHICS, AND SOCIETAL CHALLENGES.*

In each of the three main chapters, the fundamentals are presented first, supported by concrete examples. Following that, additional material that may be used for further exploring or introduced during training. This additional material includes interesting articles, videos, and movies from the field of AI. For each of the three main topics, a training day example is presented, which includes a description of the preparation and implementation of training, with concrete steps and timeframe, the conclusion, and evaluation.

Additional resources, worksheets, and handouts that can be helpful and have added value to both trainers and learners, are presented in **Chapter 7**.

Chapter 8 serves as a tool for reviewing and evaluating trainers' effectiveness and performance, which can help create personalised training about AI. It guides trainers through tasks that allow them to look at training from a critical point of view and in this way constantly improve it.

This handbook is one of the products of the Erasmus+ project AI Curriculum: AI in Adult Education ([2020-1-DE02-KA204-007713](https://www.studio2b.de/aiae-en/)). Other interesting resources made by the consortium, such as a [learning platform](#), a [toolkit for trainers](#), [basic briefings](#) about artificial intelligence and guidelines for train-the trainer are available on the **project website**:

<https://www.studio2b.de/aiae-en/>



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Throughout the handbook, you are accompanied by two characters Ingrid and Oliver, who ask and answer critical questions and give interesting facts. Ingrid, a passionate trainer on the topic of AI, and Oliver, a production worker, will offer you some insights into possible interactions between a trainer and a trainee of a training about AI.

INGRID

Ingrid is an enthusiastic young trainer who is eager to bring AI closer to society. She believes that AI can be helpful when used ethically. She is passionate about sharing her knowledge with others, who are not that familiar with AI but isn't aware that some people are afraid of or do not like AI. Her motivation and interest in this field are truly contagious.



OLIVER

Oliver is a 55-year-old man who has worked in a production company for his whole life. He is highly technically skilled. In the last few years, his job is constantly changing, due to the incorporation of AI in the working processes. He is a bit afraid of the changes, cautious, as well as sceptical about new technologies and their influence on his work, but open to learning when given the opportunity.



CHAPTER

2

HABITS OF A GOOD TRAINER

2.1 WHAT IS THE ROLE OF THE TRAINER?

A trainer is responsible for preparing, implementing and following up a training activity with learners. The trainer sets up the framework so that learners can acquire knowledge and develop skills and competences in a specific area, in the specific case in the field of artificial intelligence (AI). It is the trainer's task to create a safe learning environment in which learners can grow, acquire knowledge and develop personally.

A trainer also needs to develop and implement a training activity in such a way that the different learning styles are addressed. According to Neil Fleming, there are four different types of learning styles: visual learners, aural learners, reading and writing learners as well as kinaesthetic learners. The visual learners can absorb information well with the help of graphs and models, whereas the aural learners need to hear the information, for example through discussions, to absorb it. The reading and writing learners acquire information by reading and writing it down, and the kinaesthetic learners follow the principle of "learning by doing". According to Fleming, there are also mixed forms of learning types.

For successful training activities, it is important that a trainer is aware of the different learning styles among the learners and addresses all learning styles through a variety of methods.

2.2 WHICH COMPETENCES DOES A TRAINER NEED?

The competences that a trainer needs are diverse. Basically, three areas of competence can be distinguished:

- Training skills
- Subject competence
- Soft skills

Training skills are the basic knowledge of how to conduct a training in general as well as the basic knowledge of the conditions and methods in adult education. In the section "What are the most important skills as a trainer?" we will delve into what defines good training skills.

In addition, a trainer must have specific knowledge, skills and competences in the subject area to be taught, such as AI. This **subject competence** is a prerequisite for the learners to be able to develop in the subject area.

In addition to the so-called "hard skills", it is essential that a trainer also has certain "**soft skills**" that can enable the trainer to design a training activity and implement it successfully with learners.

The most important soft skills for a trainer are:

- Time management
- Adaptability
- Presentation skills
- Communication skills
- Facilitation skills
- Ability to empathise
- Ability to reflect

The ability to manage time well in a training activity is essential for a good trainer. Good time management is the basis for any successful training. To achieve good **time management** in training, it is important to take sufficient time for planning the training session. During the planning phase, the time frame for the various modules of the training must be clearly defined and "time buffers" must be included. This is because every group is different, has an individual learning pace and a different number of questions. These factors have an impact on the timetable of the training activity. In chapter 8 some useful tools for time management of the training are explained.

Adaptability enables a trainer to adapt to changes in their environment. It supports a trainer's ability to learn new skills and behaviours in response to changing circumstances. The ability to adapt quickly leads to success. People who are adaptable face change with optimism and a problem-solving mentality. Especially in training activities with participants who have a high variance of experience, knowledge, skills and competences in the area to be taught, it is crucial for a trainer to constantly adapt to the circumstances of the learners and the learning environment as a whole. A trainer must respond to the individual needs and evolution of each learner and cannot simply work through a pre-prepared concept without considering the group of learners. This will not lead to a successful training. On the other hand, it is also important that learners bring a certain degree of adaptability and openness to the training. This should be openly addressed and defined by the trainer as a prerequisite for successful training.

The **ability to present information** in an understandable way is one of the most useful soft skills. To present successfully, several other soft skills are needed:

- Organisation: The basis for a successful presentation is organisation. Regardless of how well a presenter has prepared the content, lack of organisation will have a negative effect.

- Creativity: Presenting content in a varied and engaging way requires a certain amount of creativity. This increases learner engagement and therefore the chances that the information presented will be absorbed.
- Self-confidence: Presenting to learners requires self-confidence and self-assurance. It is important to be confident in what you are presenting. Otherwise, you come across as unimpressive and are quickly forgotten.
- Effective communication: A presentation must be designed to fit the context. This concerns the length, the speed, the type of information presented, etc. A presenter must inform, inspire and connect.

Presentation skills are crucial to everyone's success. It has been proven that presentation skills are skills that can be learned through active work. It is important for trainers to be aware of this and to actively work on their presentation skills as they have a great impact on the success of a training activity.

In a training environment, people communicate with each other. There is no doubt that good **communication skills** are helpful and important for a trainer, but also for learners. A good trainer must be able to communicate clearly and understandably in order to present his/her own ideas and experiences to the learners. It is also important for a trainer to follow the learners' communication, listen well and understand the learners' needs.

Trainers do not simply present. An important quality for a trainer is the ability to support groups in discussions and to take on the role of a facilitator, and even further, to guide groups to develop together in a process that will achieve the intended goals autonomously. **Facilitation skills** are needed for this.

In training activities, people work together. It is important to treat each other with respect and to be aware of each other. To address the different learners in a training and to "take them along", an empathetic appearance and behaviour is central. The **ability to empathise** helps a trainer to lead and motivate groups to implement a successful training activity.

At the end of a training activity is the reflection. The focus is often on the participants' reflection on what they have learned during the training. Just as important as the learners' reflection is the trainer's individual reflection after the training. For example, the trainer can take 5 minutes for him/herself directly after the training to reflect on the process and the results of the training. A well-developed **ability to reflect** helps a trainer to continuously develop herself/himself and

her/his training style. In the chapter 8 of the handbook, reflection questions for a trainer and a model for evaluation of the training can be found.

Compared to trainers in general, there are **special skills or attitudes for AI trainers** that we would like to mention here. Trainers in the field of AI in particular should have a **great interest and affinity for this topic**. If an AI training is conducted in an online format, it is important that the trainer has sufficient digital skills to implement the training successfully and interactively.



In addition, AI trainers should be good at **facilitating discussions**. The topic of AI is still very much debatable, where many topics have no clear answers of right or wrong. Very often there is only discourse, which is an invitation for more discussions, especially in such AI training.

An AI trainer should be very interested in learning and in keeping up to date with the latest development in the field of AI, so that he or she can continue to develop. It is a very dynamic and fast-moving topic that requires a certain **adaptability and quick reactivity** from the trainers.

Last but not the least, an AI trainer shall have the **competence of deconstructing a complex topic**. As we will see through the handbook, as well as all the additional materials developed through the project, AI is not only a complicated topic that requires a solid understanding of technology, but it is also increasingly connected with almost every aspect of society. AI trainers need to be able to explain the technical features of the topic, but also the societal challenges and profound impact on our life. It is therefore crucial for the trainers to have a strong set of skills to **present a multifaceted case in a straightforward way**, and to **activate the learners** to engage with the topic in a meaningful way.

2.3 WHAT ATTITUDE/EXPECTATION SHOULD A TRAINER HAVE?



A trainer should enter training with an open attitude towards the learners. It is important to be aware of the diversity of learners, their different opinions, actions, values and goals, to accept them and to use them for the benefit of the training. A trainer meets the learners at eye level and sees the cooperation as a joint learning process. The trainer is an active part of the learning process. There should be no hierarchy between trainer and learners. People learn from and with each other. A trainer is aware of her/his own development potential and is open to developing herself/himself through the training activity and to change to the learner's perspective in between.

2.4 WHAT ARE THE MOST IMPORTANT CHARACTERISTICS OF A TRAINER?

A good trainer uses a repertoire of different "hard skills" as well as "soft skills". Structured planning and preparation of the training is particularly important for training activities. Sufficient time resources must be available for this. The following should be considered:

1. **Criteria** should be defined to decide who is suitable as a participant.
2. A **time frame and format** (online/offline) for the training must be defined.
3. Each training activity should aim to achieve certain pre-defined **learning objectives**. These learning objectives should be in accordance with the "[SMART method](#)". This allows them to be assessed. "SMART" stands for goals that are specific, measurable, attractive, realistic and time-bound.
4. The training activity must be **planned concretely**. For this, attention should be paid to a variety of methods (individual work, group exercises, discussions, case studies, role plays, simulations, presentations, use of video, etc.).
5. For planning purposes, the tool "**workflow plan**" is useful. In this planning document, each learning unit of the training is listed and supplemented with the following information:

- Time
- Working title
- Content
- Learning objectives
- Methods
- Materials



The workflow plan guides the trainer during the training.

6. **Time buffers** should also be built into the workflow plan. Each group of learners is different in prior knowledge, number of learners and frequency of questions. It is always useful to have an extra unit or an energizer planned to use when there is still time available. Ideas for such activities can be found in the Chapter 3. It is equally important to know where you can save time and skip content without causing difficulties in the learners' understanding.
7. Furthermore, all **materials** used in the training (presentations, handouts, etc.) should be well prepared. It is worth considering whether to make the materials available to learners even before a training activity.
8. An important part of a training is the **reflection** at the end of the training. A trainer should enable learners to reflect on what they have learned and monitor their own learning progress by asking specific reflection questions. In addition, it is also important that a trainer reflects on him/herself to further develop him/herself and the training.

2.5 WHAT DO TRAINERS NEED TO CONSIDER DURING CLASSROOM TEACHING AND ONLINE TEACHING?

As we approach the end of the AIAE project in 2022, we are living in a time when online teaching has become pervasive and increasingly important. The Covid-19 pandemic has significantly accelerated the pace of digitalisation in the education sector, where online teaching has quickly become a compelling alternative to classroom teaching, especially in adult education. While most of the habits of a good trainer are applicable for both settings, there are a few tips and tricks we can offer for these two different formats of teaching.

Classroom Teaching is often the conventional way of teaching most trainers are familiar with.



However, although the format is “conventional”, it does not exclude the application of digital tools in the classroom. Especially while teaching subjects such as AI, it would stimulate the motivation of the learners immediately if the trainers could invite the learners to interact with the presentation. We recommend tools like [Slido](#), [Mentimeter](#) and [Kahoot](#), which can effectively catch the attention of the learners and significantly support the training. Depending on the infrastructure of the classroom and the technological readiness among the learners, the trainers can choose tools from projector to cell phone, so that the learners can have an immediate experience with the subject and become interested to learn more.

Since online teaching has become a common practice in the field of adult education, the benefits of classroom teaching should be advertised. In spite of the wide range of communication tools and social media, the invaluable interaction among the learners remains one irreplaceable feature that draws learners into the classrooms. Trainers should therefore provide the learners with sufficient time and space for small-group discussions, as well as small talks and individual conversations. The bilateral dialogues with trainer and learner is also considered as a unique advantage of classroom teaching, and the personal input of trainers is always highly appreciated by the learners. It would be greatly beneficial, when the trainers can include interpersonal communication into each lesson unit and to realise the full potential of classroom teaching.

Online Teaching has become increasingly popular in recent years because of its flexibility and efficiency, but it also comes with a few challenges. One of the main challenges is the technical requirements. Not all learners have the necessary equipment, such as a desktop, laptop or tablet. And even with the right equipment, it is important to make sure that the hardware is compatible with the online teaching software. We recommend an individual session of technical check in advance, not only to make sure that all the technical problems are solved before the first lesson



starts, but also to make the learners feel comfortable and confident with the setting of online teaching, so that they are able to take part in the training actively.

Many studies show that the attention span during online learning is far shorter than classroom learning. It is of great importance for the trainers to take this into consideration during the preparation of the lessons, and plan the lesson units of online teaching shorter than those of classroom teaching. Make sure to include a few different formats in the course of the online teaching – small group discussion, survey, Q&A session, to name a few. And add a small break or an energizer between each lesson unit. We recommend a creative combination of teaching methods during the online teaching, and keeping the learners engaged through the interaction between trainers and learners, as well as among learners themselves.

In this handbook, we have also included a few examples of training sessions, which indicate the different kinds of preparation necessary for both offline and online training. Depending on the topic of the training, both formats have the potential to deliver the optimal training experience. However, when it comes to the technical topics that involve interacting with softwares and apps (i.e. “machine learning” or “facial recognition”) online training does have a slight advantage of connecting the learners with the technologies directly.



2.6 TIPS FOR A GOOD TRAINER

1. Vary your training and the methods you use to address the different types of learners.
2. A training activity is not only about passing on knowledge. Leave enough room for practical exercises of what has been learned and for questions. Take this into account actively when planning the training.
3. Take enough time at the beginning of a training session to "get to know" the learners. It is important to know the learners' prior knowledge and skills. At the beginning of the training, ask learners about their background and previous experience. Through interactive methods, a pleasant and relaxed learning atmosphere is created right at the start of the training.
4. In addition, ask about each learners' needs in the context of the planned training and their motivation for participating in the training to adapt the training to the learners in the best possible way.
5. Use a flipchart or similar to briefly explain the different learning types at the beginning of the training. Let the participants position themselves.
6. Start a training by asking the learners about their expectations and inform them about what the training can and cannot provide. Refer to the learners' expectations at the end of the training. Aside from expectations, it can be beneficial to ask the participants about their possible contributions. How can they contribute to the training?
7. It is not the claim of a trainer to know everything and to be able to do everything. New knowledge is created together in every training activity between learners and trainers, especially in the field of AI. Answers to very specific questions can also be provided later, if necessary.
8. Every group of learners is different and has different needs. A trainer needs to be aware of this and accept that every training activity is therefore unique.



CHAPTER 3

USEFUL TRAINING METHODS

3.1 ICEBREAKERS

At the beginning of the training, learners do not necessarily know each other. For this reason, as well as to create a safer environment, the training can begin with an icebreaker activity.

An **icebreaker** is an activity designed to welcome participants and warm up the conversation in a meeting, training class, team building session, or other activity. Icebreakers can be customised according to the theme of training classes. Another form of the icebreaker is **energizer**, which is a tool to inject energy into the process, get people moving, and break the initial tension through body movement.



3.1.2 EXAMPLES OF ICEBREAKERS AND ENERGIZERS

STAND UP IF...

- Length: 5 – 10 minutes
- Number of participants: up to 25
- Remote-friendly: YES **When using online: Alternative to getting up and sitting down is switching the video camera on/off or raising a hand.*
- Goal: Warm-up, increase participation, and lay the foundation for the initial discussion of a lesson or activity within the training.
- Instructions:
 - Prior to the workshop, the trainer prepares a list of closed questions that can only be answered with yes or no. For example: *Is AI used in the company where you work? Do you think robots can think? Do you know how AI is incorporated into our everyday lives? Do you think we need AI? Would the world be better without technology?*
 - Introducing activity to participants: A series of questions will be read. Quickly stand up if the statement applies to you, in other words, if you agree with it. Remain seated if your answer to the question is "No.".Take a look around the room to see who is standing and who is seated. This is a quiet activity, so simply pay attention to your and colleagues' reactions.
 - The trainer then fairly quickly reads the questions to the participants. For each statement, the participants stand up if they answer the statement with yes.
 - If time allows, invite participants to share an experience of quick answering questions. This can offer you a good basis for an introduction to the workshop theme.



OBJECT STORIES

- Length: 10 - 15 minutes
- Number of participants: 5 – 15
- Remote-friendly: NO
- Goal: This activity wakes up participants and breaks the tension. It can be well integrated into the topic of technology and artificial intelligence.
- Instructions:
 - Collect together a number of objects and place them in a bag. The objects can include everyday items (pencil, key-ring...), but also objects that are referring to the topic of technology (mobile phone, GPS navigation, headphones, camera, etc.)
 - Seat participants in a circle and pass the bag around the group. Invite participants to dip their hands into the bag (without looking) and pull out one of the objects.
 - The person who begins to pull out an object starts with telling an imaginative story that includes his/her object. The story can be somehow connected to the topic of the course.
 - After 20 seconds, the next person takes up the story and adds another 20 seconds, incorporating the object they are holding. And so on, until everyone has made a contribution to the story.

WHAT AM I?

- Length: 10 – 15 minutes
- Number of participants: 4 – 5
- Remote-friendly: YES
- Goal: Challenging participants out of their comfort zone by using their imagination, also energising because of the movements.
- Instructions
 - Prepare notes with the names of specific objects within the field of technology, machine learning, and artificial intelligence. For example *ROBOT, COMPUTER, SIRI/ALEXA, SELF-DRIVING CAR, GPS NAVIGATION, CASHIERLESS SHOPPING CHECKOUT, UNLOCKING PHONE WITH FACE ID, ROBOTIC SURGERY.*
 - Put the notes into a bag. Then instruct participants to pull out one of the notes. Their task is to show the object written on the page with a pantomime. Warn them not to use any sound. Explain to them that the game is based on the field of technology.
 - Each of the participants then shows an object, until the others guess it.
 - Keep playing until everyone performs.
 - * If the participants are not comfortable with that much exposure, you can customise the game so that instead of pantomime, participants draw objects on a piece of paper or a whiteboard.

HUMAN MACHINE

- Length: 5 – 10 minutes
- Number of participants: 20
- Remote friendly: NO
- Goal: This activity gets participants moving and working together in a way that generates energy and promotes collaboration.
- Instructions:
 - Ask everyone to form a huge circle. Explain to the group that their objective is to create a human-machine with movements and sounds. Each individual will become a moving part of the machine.
 - One participant joins the circle and begins producing a repetitive sound and a body movement. After 5 seconds, another participant joins the circle and unites with the first, likewise generating a sound and a movement.
 - Continue to create the machine until everyone is linked, with everyone providing their own motions and noises throughout.

3.2 VARIOUS TRAINING METHODS

Considering different learning styles of the learners, trainers should adjust the training to their needs. In order to increase the motivation of the learners, various training methods can be used, to assure diversity, flow and suit participants with different needs. In this chapter, training methods such as World Café, 1-2-4-All, Future mapping, Mash-up Innovation and Researcher are explained. At the end of the chapter, general guidelines for discussion as a form of interaction at the training are listed, since trainers usually encounter discussions with the learners during the training.

3.2.1 WORLD CAFÉ



Length: 60 – 120 minutes



Number of participants: 15 + participants



Definition

World Café is a method for enabling meaningful conversations led by participants and the topics that are relevant and important to them. Trainers set up a cafe-style environment and offer directions, while participants self-organise and explore a collection of suitable themes for discussion.



Used for

- Information sharing.
- Collaboration and network building.
- Reflection.
- Project planning.
- Generating new ideas.



Skills practised

- Teamwork.
- Active listening.
- Discussing issues.
- Expressing opinions.
- Time management.

- Creative thinking.



Materials

- Tables and chairs.
- Decoration (e.g., tablecloths, bouquets, coffee, biscuits) to make the space feel comfortable and casual.
- Large paper on each table to write down ideas.
- Markers and pens in different colours.
- Bell to announce round ending.



Flow

1. *Welcome and introduction:* Begin with a welcome and an introduction to the World Café process, setting the context and sharing guidelines of activity.
2. Form a group of a **maximum of 5 people** at one café-style table.
3. Every café-table picks a host, who then selects a lead writer, who will put down ideas. Also the other members of the group can write, draw and create on the paper.
4. *Small-group rounds:* Each group has 20-minute rounds of conversation and discussion about a **question** trainer provides.
5. After 20 minutes the host of the café-table remains at the same table, while others move to a new table and form new groups with a maximum of five members in each. Hosts explain the findings of the previous group to the new group.
6. The same is repeated through two more questions asked by the trainer.
7. After the third round, all hosts present the most important findings of their table in all three rounds to everyone in 15 minutes.
8. Then all participants are invited to share insights and findings from their conversations. Encourage them to present collective knowledge in creative ways (make a story, graphic recording, sticky notes, drawings, etc.)



What could go wrong?

- World Café requires **clear** and **relevant questions**, which can be challenging to develop. Have in mind that powerful questions are simple, clear, provoking, relevant to the context, and energising.
- Due to the long time frame, participants may lose motivation. Make sure you provide them **breaks**.
- World Café is not appropriate for making direct decisions.



Tips for running this activity online

- Using an appropriate platform that allows interactive group discussion (Zoom, Webex, Remo, Miro, Yotribe).
- Use of online tools for graphic presentations of collective knowledge, like virtual whiteboards (Stormboard, Jamboard, Realtime Board).
- Establish a technical team for coordination and support.

An example of using this activity in the AI training is presented in chapter 5.2.

3.2.2 1-2-4-ALL



Length: 12 minutes



Number of participants: 4 +



Definition

1-2-4-All technique includes everyone, regardless of how large the group is. It can assist in the generation of more and better ideas in a very short amount of time. Also, can get everyone involved in producing questions, thoughts, and proposals in under 12 minutes. It is a technique of self-reflection, dialogues in pairs and fours, and group discussion.



Used for

- Generating new ideas and solutions.
- Reflecting on the issue.
- Engaging everyone.
- Creating collective intelligence.



Skills practised

- Constructive expression.
- Active listening.
- Practice self-discovery.
- Curiosity and creativeness.



Materials

- Chairs and open space.
- Papers.
- Markers.
- Bell and timer for announcing transitions.



Flow

1. *Preparation*: Prepare a question in response to the issue or about a problem to resolve or shape new views. Make sure the question is clear and broad enough to generate new ideas. (e.g., What opportunities do you see for making progress on this challenge? What would you do in this situation? What ideas or actions do you recommend?)

2. **SOLO** (1 minute): Silent self-reflection by individuals on the proposed question.
3. **PAIRS** (2 minutes): The group is then split into pairs. They generate ideas in pairs, building on ideas from their self-reflection.
4. **FOURSOMES** (4 minutes): The pairs are now gathered into small groups of 4. Now is the time to identify the similarities and differences between the ideas stemming from the pairs. This stage aims to share, filter duplicates, and feed the thought process by strengthening the agreements and discussing any differing points of view.
5. **ALL** (5 minutes): The foursomes then get together. Ask everyone in the group: »What main idea has stood out from your discussions? « Each group then shares their main idea in turn, which helps to highlight the key ideas.
6. *Wrap up*: After multiple rounds, the trainer summarises important findings of the discussion.

? What could go wrong?

- Not matching the time frame. If necessary, the trainer can allow additional time for each step depending on the topic's complexity. But keep time periods as short as possible to avoid interfering with the workshop's goal of being quick and to the point.
- The discussion did not go into depth. Try adding different ways of presenting the final ideas (graphs, drawings, etc.) or repeat the exercise with another question.
- It can become monotonous. Go broader by adding an additional step of exchanging in foursomes, for example remixing the groups of four.

Tips for running this activity online

- Using an appropriate platform that allows interactive group discussion and breakout rooms (Zoom, Webex, Remo, Miro, Yotribe).
- Instead of talking, pairs and foursomes can discuss through writing or doodling on a virtual whiteboard, then presenting sketches to all in the group (Stormboard, Jamboard, Realtime Board).
- Free template for virtual version on Klaxoon: <https://klaxoon.com/community-content/1-2-4-all-the-brainstorming-method-used-to-generate-ideas-alone-in-pairs-in-foursomes-then-all-together>

An example of using this activity in the AI training is presented in chapter 4.2.

3.2.3 FUTURE MAPPING



Length: 30 – 60 minutes



Number of participants: 2 – 40+



Definition

Future Map is a method for creating a shared view of trends in different fields in the recent past, present, and future. The aim of this method is to show major patterns and analyse different trends from the previous year, this year, and the next three years. It is beneficial for facilitating discussion and debate on broad topics such as society, technology, politics, and the environment.



Used for

- Encourage discussion.
- Generating different views.
- Identifying potential challenges.
- Providing coping mechanisms.



Skills practised

- Thinking out of the box.
- Analytical thinking.
- Expressing opinions.



Materials

- Clear wall.
- Markers, pens.
- Post-it notes.



Flow

1. *Preparation:* Before the workshop make sure that you have a long empty wall with space in front of it, so the participants can move around. Divide the wall into three equal sections. At the top of each section write with a thick marker: last year/past, this year/present, and next year to five years in the future/future. Choose a specific topic, within technology, AI or machine learning, that you want the learners to think about. If



the topic is not familiar to the learners, give a short presentation of the topic before the activity.

2. *Introduction:* Give each participant a marker and sticky note, then explain the aim of this workshop: *»We will, together, create a vision on the future, through the lens of the past and present. Think about significant trends, difficulties, challenges, etc. for this specific topic. Write it on the post-it notes, stick it up on the wall and read it out loud so other colleagues can hear. There is no need to wait, as soon as you come up with something, write it down and stick it up. The aim is to fill up the wall in the next 15 - 20 minutes. «*
3. Starting with last year/past, moving to this year/present and then next five years in the future/future.
4. When the time is up, have the participants look at the post-its on the wall for **patterns** and common themes from each year. If there is enough time, divide them into groups and give them around 10 minutes to sort the trends by year and produce a summary of the important patterns.
5. After that, run a group **reflection** and **discussion**. Ideas for some questions:
 2. What patterns do we see looking at this timeline?
 3. Which trends are most important for me as an individual and the society as a whole to be aware of and learn more about?
 4. How do I feel about the past, present, and future?
 5. What does this mean for our team? Our company? Our society? And my own role?
6. *Wrap up:* Point out some of the key themes that came up throughout the discussion. Close up by inviting each participant to share one takeaway message from the training.

What could go wrong?

- Introverted participants may fade into the background because this is a fast-paced and frequently loud workshop with a lot of participants. Encourage full participation by lifting the softer voices and encouraging those who have not yet spoken up.
- Ask relevant questions or offer ideas to motivate the group if you feel the tempo is lagging.

Tips for running this activity online

- Instead of a wall, use a digital whiteboard, where participants can post-it sticky notes, such as Jamboard.
- Using an appropriate platform that allows interactive group discussion and breakout rooms (Zoom, Webex, Remo, Miro, Yotribe).

An example of using this activity in the AI training is presented in chapter 4.2.

3.2.4 MASH-UP INNOVATION



Length: 60 – 120 minutes



Number of people: 2 – 40+



Definition

Mash-up is a method of collaborative idea development in which participants create new concepts by combining various elements. Participants brainstorm about several fields in the first stage, such as technologies, artificial intelligence, machine learning. Then, in the second stage, they quickly combine parts from their brainstorming to come up with fresh and inventive ideas or strategies.



Used for

- Generating different views.
- Generating new ideas.
- Solving problems in a specific area.



Skills practiced

- Lateral thinking.
- Finding connections.
- Expressing opinions.



Materials

- Sticky Notes.
- Markers.
- A4 paper.
- Board/wall.



Flow

1. *Preparation*: Prepare a specific area for which you want participants to develop new perspectives or strategies. If you want specific answers, you need to ask a specific and clear question, but still open enough for participants to think broadly (e.g., *How does technology affect the performance of your organisation? How can artificial intelligence make your job easier and help you with your tasks?*). In this exercise, participants can also highlight issues in a specific area (e.g., *How can technology hinder your workplace? What*

do you find problematic about integrating robots in the workplace? Where do you see the problem in technology development?).

2. *Brainstorming:* Invite participants to brainstorm ideas about the question you asked them. Brainstorming is individual, everyone writes one idea on a sticky note, tells the idea out loud, and sticks it on the board/wall. They have 3 minutes, so the brainstorming is active and fast-paced.
3. *Mash-ups:* Divide participants into smaller groups of 3 to 5 people. Tell them they have 12 minutes to come up with as many mash-up ideas as possible. A mash-up is created by combining two or more components from the wall to produce new thoughts, ideas, or strategies. They put it on an A4 sheet of paper, it must contain a catchy name and at least 2 concepts from the brainstorming wall.

*Additional tip: Play energetic music and urge the participants to be on their feet, active, and working swiftly throughout these 12 minutes.

4. *Presentations:* After those 12 minutes, have each small group share their mash-up concepts to the rest of the group in 5 minutes. Display all of the ideas on the wall to graphically demonstrate the volume of concepts created.
5. *(Optional) Develop:* If you estimate that it will be functional and if time allows, you can invite participants to select their favourite and most practical mash-up concept and develop it further for 30 minutes, investigating the concept's features, functionality, advantages, and disadvantages. Each group uses one A4 paper to visualise and work out in detail the selected favourite mash-up, and report it back to the whole group.
6. *Reflecting:* End workshop by inviting participants to reflect on questions such as:
 - How did it feel to engage in such a creative way?
 - What made it easy? What was the most difficult part?
 - What are some takeaways?
 - How will you put your newfound knowledge to use in the future?

? What could go wrong?

- Introverted participants may fade into the background. Encourage every participation by lifting the softer voices and encouraging those who have not yet spoken up.
- The final concept is not as alluring as we expected. As a trainer, make sure to set high expectations at the beginning, and then constantly remind participants of them. While mashing-up, if you notice that they are leaning in the completely wrong direction, such as your goal, direct them in the right direction.



Tips for running this activity online

- Instead of a wall, use a digital whiteboard, where participants can post-it sticky notes.
- Using an appropriate platform that allows interactive group discussion and breakout rooms (Zoom, Webex, Remo, Miro, Yotribe).
- For presentation, place all of the ideas in one area to display all the concepts generated.

3.2.5 RESEARCHER



Length: 90 minutes



Number of participants: 6 +



Definition

Researcher is a technique of group research on online sources of a specific topic. Participants gain new knowledge on a particular topic and prepare handouts that can also be shared with other participants. It is a good technique for interactive learning and encouraging discussion among participants.



Used for

- Gaining new information.
- Engaging everyone.
- Creating collective intelligence.
- Collaboration and network building.



Skills practised

- Teamwork.
- Information searching and filtering.
- Constructive expression.
- Active listening.
- Curiosity and creativeness.



Materials

- Chairs and open space.
- A4 papers.
- Markers and pens.
- Bell and timer for announcing transitions.
- Smartphones, laptops.
- Internet access.
- Projector.



Flow

1. *Introduction:* The activity will start with the trainer giving a brief presentation of the main concepts of a particular topic. On this, learners will explore more deeply into the topic. They will look for definitions, examples and interesting videos.
2. The trainer gives a brief presentation of the theme. *10 minutes*
3. Learners are divided into groups of 4 or a maximum 5. Every group chooses a group representative. Each group has an A4 sheet, pens, and coloured markers. Participants should have their own smartphones with internet access, or we provide them with laptops with an internet connection. *5 minutes*
4. Each group draws one subtheme. The task of the group is to do research resulting in handouts for the drawn theme. *30 minutes*

Handouts should include:

- Definition
 - At least 4 concrete examples (the trainer can adjust the number).
 - Interesting YouTube video relating to the chosen theme. Should be interesting and short (maximum of 2 minutes).
5. Each group gives a presentation of their handouts (*10 minutes*). The presentation is made by a previously selected representative of the group. He/she presents the definition, examples of usage, and plays a YouTube video. After each presentation, every group asks at least one question or gives feedback on the presentation (*5 minutes*). *Total of 45 minutes*

? What could go wrong?

- Not matching the time frame. If necessary, the trainer can allow additional time for each step depending on the topic's complexity and the learner's engagement in the discussion. Illustrate the elapsed time with the sound of a timer or a bell.
- The discussion did not go into depth. Help learners with additional questions for reflection or giving feedback.
- They can't find the right information. During the workshop, walk from group to group, and monitor progress. If you notice that they are stuck, offer help: e.g. with keywords, specific webpages.



Tips for running this activity online

- Using an appropriate platform that allows working in breakout rooms (Zoom, Webex, Remo, Miro, Yotribe).
- Instead of using A4 papers for handouts, they can use virtual posters makers (Canva, Venngage)

An example of using this activity in the AI training is presented in chapter 4.2.

3.2.6 GUIDELINES FOR DISCUSSION



Length: depends on the topic and group



Number of participants: 2 +



Definition

The discussion involves two or more participants conversing or engaging in meaningful debates about a certain topic, which is led by a trainer. There are different types of discussion, but in this subchapter, some general guidelines will be explained.



Used for

- Reviewing course material.
- Deeper understanding.
- Exchanging experiences, information.
- Generate new ideas.
- Assess needs.
- Understanding complex ideas.
- Decision making.



Skills practised

- Communication.
- Creativity
- Constructive expression.
- Active listening.
- Empathy.



Materials

- No special materials are required. Trainer can use whiteboard/poster and pens to write down general ideas and findings.



Flow

1. *Prepare for discussion*: Think about what you want your participants to get out of the discussion. Do you want them to share responses, make new connections, generate new ideas etc. Ask yourself this question: *What is the purpose of this discussion?*

It is not necessary to set a clear goal because a lot of discussions are based on the expression of different ideas, which in turn leads to the formation of a goal later. On the other hand, it is important to set a clear topic on which the discussion will take place.

2. *Select discussion format:* Although the ideal discussion is spontaneous and unpredictable, you will want to do some careful planning. You can organise a discussion in many different ways:

- **Think-Pair-Share:** Give participants a problem cue to consider on their own, then have them pair up and share their thoughts or solution with someone nearby. Then, each duo can present their ideas to the larger group.
- **Brainstorming, small and large groups:** Participants sit around the room at small discussion group tables. Small groups debate the first issue for a certain period of time (20 minutes), and then each small group reports back with 1-3 significant ideas. This process is repeated for each discussion point.
- **Traditional debate:** Two opposing groups taking turns presenting a point and responding to the other side's ideas.
- **Voices in a circle:** Participants create groups of five people. Groups get 3 minutes of silence to think about a specific topic. Each member of the group has three minutes of uninterrupted opportunity to discuss the issue with other members of the group. After, other members can respond to the comments that have been made.
- **Open group discussion:** Participants sit in a circle. As the leader of the discussion, we give an initial question that relates to a specific issue. Participants are free to engage in discussion, following the rules of listening and respecting other co-speakers' ideas and views.

3. *Create safe discussion environment:* Group members will be more likely to contribute to a discussion if they feel safe and comfortable. Use an icebreaker or energizer activity at the beginning, where they can introduce themselves and break the tension. Avoid traditional school sitting, rather sit participants in the way they can see each other. Of course, it depends on the format of discussion, but the most optimal is sitting in a circle.

4. *Establish rules:*

- Everyone should treat others with respect, no name-calling, angry outbursts, or accusations.
- Direct arguments at ideas and viewpoints, not on individuals.
- Disagreement should be verbalised respectfully.
- Listen actively, without interrupting.
- If someone disagrees with you, try to understand other points of view.

5. *Steps to lead discussions:*

- *Introduction* - Explain the purpose, topic, and rules of the discussion. Be clear upfront about expectations and intentions amongst participants and the facilitator.
- *Icebreaker* - Begin with some form of icebreaker or energizer, to break the tension and connect participants.
- *Ask open-ended questions* to open up discussion. Open-ended questions usually start with how, what, why, tell me, describe... Then move to analysis, and finally to evaluation, judgement, and recommendations.
- *Provide structure with questions:*
 - How is ... an example of...? How is ... related to...?
 - What are the parts of ...? How would you compare/different ...?
 - What do you predict about...? How would you create...? What would the result be if you combined...?
 - What are your points of agreement/disagreement and why? What criteria would you use to ...?
 - What exactly do you mean when you say ___? Could you clarify this?
 - What is (person's) perspective on this? How may (individual, organisation) go about resolving this issue?
 - What are the advantages of this point of view? What about disadvantages?
 - That's a fascinating contrast to what was stated by _____. What difference have you noticed between these statements?
- *Involve all participants* - Ask directly for their opinion and encourage them with body language, but at the same time respect, if someone has decided to listen instead of speak.
- *Summarise* – At the end of the discussion summarise important ideas, points, and arguments that emerged in the discussion.

The role of the moderator:

- Be neutral and respectful.
- Do not contribute or evaluate ideas.
- Suggest alternative methods of working.
- Protect individuals and their ideas from attack.
- Encourage everyone to participate.
- Maintain boundaries.
- Be self-aware and aware of others.

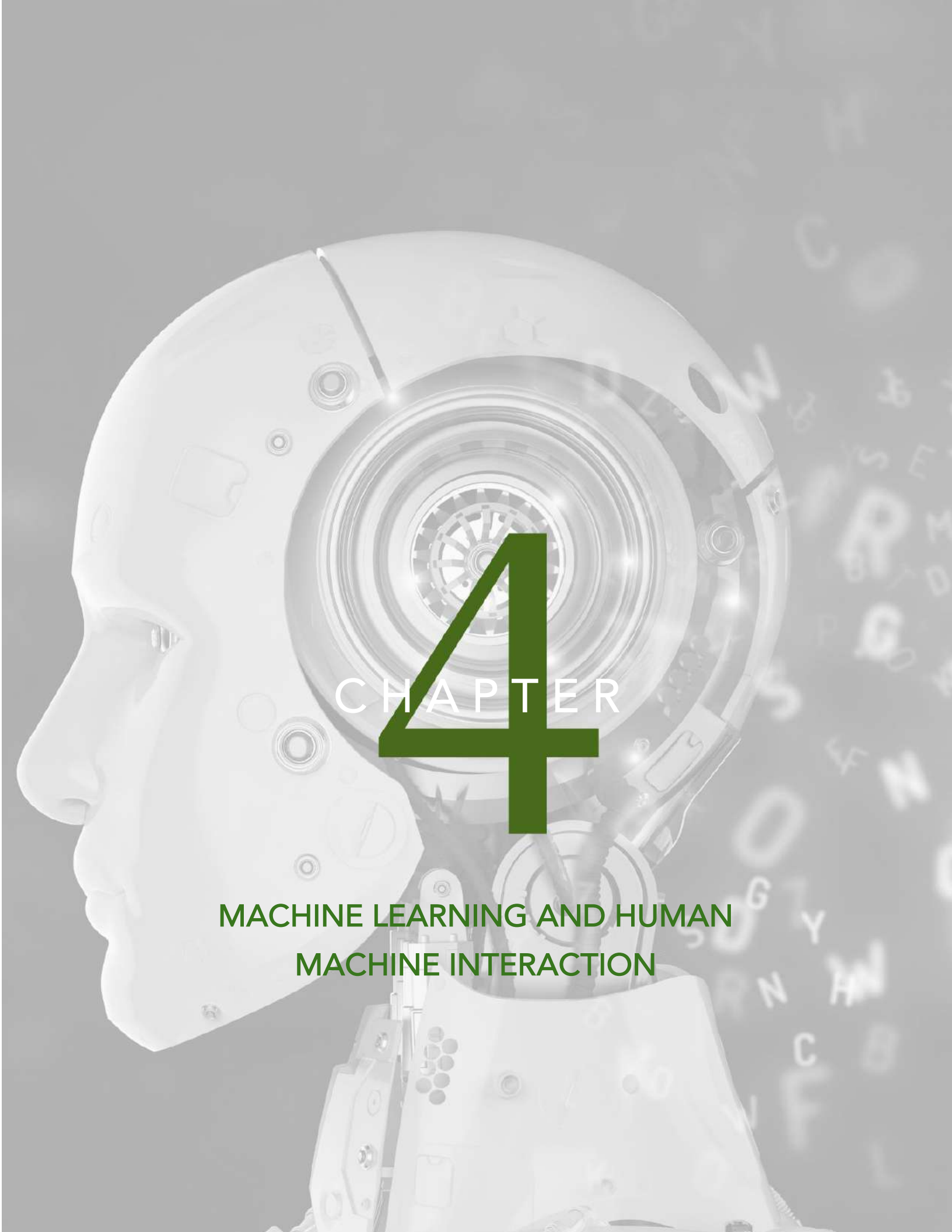


? What could go wrong?

- Tension results in an argument. Develop and communicate clear rules at the beginning of the debate. If the argument happens, the trainer should calm down participants and use mediation skills.
- Non-participating. Be aware of non-verbal signs of readiness to speak and encourage the learner to start speaking. Flip statements into questions: *Do you agree with that argument?* Ask non-participates to sum up what's been said, without attacking them. Sometimes the trainer does not know the reason why someone is not participating. If appropriate, you can address this privately with the learner.
- Discussion monopolizers. Ask to act as observers for a few sessions, reporting back their observations to the group.
- Attacking the facilitator. Paraphrasing (sentence rephrasing) the message so they gain insight of their assumptions, without returning the attack or stepping into a defensive mode. Asking for context to get a better picture of what bothered the learner. Active listening of what the learner has to say. Asking other learners for their point of view.

💡 Tips for running this activity online

- Using an appropriate platform that allows working in breakout rooms (Zoom, Webex, Remo, Miro, Yotribe).



CHAPTER

4

MACHINE LEARNING AND HUMAN
MACHINE INTERACTION

In the next three chapters, three topics connected with AI will be explained more in detail. At the beginning of each chapter, some theoretical basics about the topic are explained. These materials can be used to briefly present the topic to learners, debrief the trainer, as well as to use specific paragraphs as the contents for the learners of the course.

4.1 BASICS OF MACHINE LEARNING AND HUMAN MACHINE INTERACTION

Machine learning (ML) is the dominant branch of Artificial Intelligence (AI) and is being used anywhere AI applies. ML is a subset of AI which teaches computers to learn like humans by exploring data, identifying patterns and learning from them. We will look at three different machine learning techniques with illustrative examples of machine learning.

Human machine interaction refers to the interaction, the communication and the interfaces between humans and machines or computers. We will look at various examples which show an interaction between humans and machines.



4.1.1 MACHINE LEARNING TECHNIQUES AND EXAMPLES

DEEP LEARNING

Deep learning is a subfield of machine learning that feeds raw data through a neural network which mimics the human way of processing information. Deep learning systems learn and improve on their own by utilising computer algorithms.



Where is deep learning used?

- **Search engines** like Google search: Google like most search engines use automated programmes to help generate its search results thanks to a large index of keywords
- **Robotics:** a field with many machine-learning models to help robots decide what they should do and how they should do it.
- **Autonomous cars and semi-autonomous cars:** automating repetitive tasks in driving situations.
- **Machine translation:** automated translation such as Google Translate, DeepL; Machine translation is a complicated task for which it is necessary to understand the context of the sentences, the linguistic properties of both the source and the target language and how words combine with each other. There is still a lot to improve in machine translation, but the translation quality on Google Translate and DeepL so far is already high and keeps improving thanks to deep learning and neural networks. However, it is difficult to use deep learning if there is no large volume of data, which is the case for specific language combinations.
- **Computer vision and visual recognition:** speech recognition, object/image recognition, face recognition, gesture recognition, optical character recognition.



Ingrid: "I find computer vision very useful, especially in image recognition and face recognition which is used in digital video cameras, webcams and surveillance systems."



Oliver: "Sometimes this makes me a bit worried though to see how often it is used and for what purposes."



Ingrid: "My sister works at a post office and she was telling me that a sensor machine deciphers the handwriting, then digitises the address and feeds the information into a database so that the letter gets directly to the target. I think that's really a cool thing as well!"

- **Classifications and predictions:** automated decision-making in companies, natural disaster prevention, traffic prediction on Google Maps, e-mail and spam filtering; Machine learning and in particular deep learning can be used for natural disaster prevention. For example, there are laboratories in which experts track climate data and air pollution data from the previous years and then train a model, which should be able to predict future weather and climate factors, based on historical data.

SUPERVISED LEARNING

Supervised learning is the most common sub-branch of machine learning, referring to how a machine learning programme is given data to learn from: The programme is given clearly sorted and labelled data and is explicitly programmed to sort out those exact labels.



Where is supervised learning used?

- **Visual recognition:** a pose estimation model that detects different poses
- **Visual classification, visual identification and interpretation:** sorting garbage
- **Estimation of parameters from data collected by Earth Observation satellites:** in precision farming in agriculture
- **Decision support:** estimating investing risk



Oliver: "I have a friend that works at the landfill. Last month they started using a robot that is now learning how to sort garbage by using visual identification. The robot spends all day picking out recyclable items from garbage while passing on a conveyor belt. All items sorted by the robots into different bins are labelled with an identification number on a sticker. Once a day human experts verify the bins and inform the robots about any mistake. The robots use this feedback to learn from their mistakes and improve on that. My friend said that the robot is improving rapidly and that it will soon be ready to take some workload off the other workers."

UNSUPERVISED LEARNING

Unsupervised learning refers to how a machine learning programme is given data to learn from and involves the programme to sort and classify the data on its own, based on trends and correlations that it sees in the data.

Where is unsupervised learning used?

- **Dimensionality reduction:** technique used when the number of features or dimensions in a given dataset is too high
- **Visual recognition**

4.1.2 EXAMPLES OF HUMAN MACHINE INTERACTION

INTERFACES

Interfaces are hardware devices or programmes enabling a user to interact and communicate with a computer or computers. The goal of human machine interaction is to create good interfaces between a human individual that wishes to perform a given task and a machine that performs that task. The future of human machine interaction is to have systems that can interact with us in a way that is familiar to us, either through language or visual language that is easy to understand.

EXAMPLES:

- A graphical user interface
- Talking robots



Oliver: "Some user interfaces are very straightforward as long as you understand these interfaces. For instance, you know that a small cross on a computer window means closing the window. For more sophisticated tools it is obviously a bit harder because you need to find something that is intuitive enough and powerful enough to enable the range of possibilities for a particular device. Because what a robot can do and say is quite large."



Ingrid: "Talking robots are another kind of interaction that is quite different from a computer window on your screen, but in talking robots as well, there is an interface since they use spoken language to provide instructions and receive feedback on what is happening during the execution of a task."

A **perceptual user interface** is an interface that allows users to interact with computers or machines without having to use a keyboard and/or a mouse.

EXAMPLES:

- Gesture control and gesture recognition
- Voice activation and voice recognition

COMMUNICATION

In the past humans had to adapt to the constraints of the interfaces they were dealing with and had to learn how to operate the interfaces. The interface itself had no adaptation. Nowadays the machines and interfaces are trying to adapt to the human users and talk their language.

Language technology and Natural Language Processing (NLP) technology
Language technology allows machines and interfaces to interact with humans in our most intuitive communication medium, which is natural spoken language. Because that's what we spend most of our life doing: talking and listening to each other in natural spoken language.

Of course, this is not easy to achieve because a natural language is ambiguous, vague, sometimes contradictory and uncertain. Moreover, various interpretations are possible. The challenge of language technology is the different access to technologies and resources depending on the country and the language. There is a huge difference between a native speaker of American English and a native speaker of a remote African language for instance. The quality of a translation into a broadly spoken language will always be better than into any minor language because it depends on the amount of data and on the quantity of material used in machine learning.

EXAMPLES:

- Voice-controlled virtual personal assistant
- Smart homes



CONTROL OF DEVICES, MACHINES, COMPUTERS, SYSTEMS

In human machine interaction transparency is a key element. The systems need to provide explicit signals to humans on what the systems have understood and what they have not, so that the users are as much as possible in control. Because if humans don't receive any information, nor feedback on what the systems have understood, then they can not have any control on them. Devices can be controlled directly as well as indirectly. When they are directly controlled, users/operators issue commands to the machine. When they are indirectly controlled, machines automatically identify what people want.

EXAMPLES:

- Selection on a web browser or on a touch screen
- Commands to a smartphone

EXAMPLES:

- A chatbot providing "live" support to customers on a website, replying automatically to their questions and improving their knowledge
- A navigation system proposing an alternative route in case a turn, for instance, is missed by a driver
- A smartwatch that automatically stops recording a running activity when the

HUMAN-MACHINE INTERACTION COMBINED WITH VIRTUAL REALITY, AUGMENTED REALITY OR MIXED REALITY

Combining Human–Machine Interaction (HMI) technologies with Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) can help people control machines or computers remotely, practice and acquire advanced skills and competences in a virtual environment and experience new things.

Virtual Reality (VR) is a fully immersive technology, which tricks humans into thinking they are in a different environment from the real world by creating a computer-generated simulation of a 3D image or environment.

EXAMPLES:

- Virtual tours of museums, galleries through VR glasses
- Virtual trips to exotic destinations through VR glasses

Augmented Reality (AR) is a technology that overlays digital information on real-world elements, producing a composite view.

EXAMPLES:

- In-store shopping experience: the IKEA AR mobile app takes pictures of a living room, measures the space, and recommends the furniture that fits the space.
- Live language translation: assistance in real-time thanks to AR translation applications

Mixed Reality (MR) brings together real and digital world elements allowing users to manipulate physical and virtual items and environments.

EXAMPLES:

- Entertainment: a game that occurs in a real place such as a park or a street and the game characters participate with a smartphone or mobile device.
- Commerce: improving sales with tools allowing customers to visualise products in real environments like the ability to see a couch in your living room before you order it.



4.2 EXAMPLE OF A TRAINING ON MACHINE LEARNING AND HUMAN MACHINE INTERACTION

4.2.1 PREPARATION



Time: approx. 6 pedagogical hours and breaks



Learners: Adult learners wanting to know more about machine learning and its interaction with humans.



Learning outcomes: After the training, participants will learn about the theoretical framework of machine learning within three different machine learning techniques. Through interactive activities, they will learn about everyday examples of the interaction between humans and machine learning and thus gain understanding and insight into the subfield of AI.



Methodology: icebreaker, group work, discussion, activities: 1-2-4-All, Researcher, Future mapping, evaluation and self-reflection.



Equipment: A4 papers, sticky notes, colour markers, pens, projector, computer and internet access, bell/timer, printed materials (worksheet for 1-2-4-All on basics of machine learning, theoretical materials on examples of human machine interaction, and worksheet for future mapping), sticky notes on machine learning techniques for the draw.



Preparation of the classroom: Classroom should be open, and have tables, chairs, and whiteboard/board/space on the wall. When doing an activity in a virtual environment, choose the appropriate platforms for group work and handout designing (Jamboard, Padlet...)

4.2.2 IMPLEMENTATION

TIME	DESCRIPTION OF EACH ACTIVITY
<p>15 minutes (the time might vary depending on the number of the participants)</p>	<p>ICEBREAKER: “STAND UP IF...”</p> <ol style="list-style-type: none"> 1. The trainer prepares a list of questions about the field of machine learning that can only be answered with yes or no. Some examples: <i>Is machine learning part of your everyday life? Do you think robots can think? Would the world be better without technology? Is Google Translate machine learning? Is machine learning used in garbage recycling? Have you ever tried VR (virtual reality)? Have you ever tried face recognition at the airport? Has Google Maps ever helped you avoid traffic jams?</i> 2. The trainer then explains the rules to learners: “A series of questions will be read. Quickly stand up if the statement applies to you. If your answer is no, keep seated. Take a look around the room to see who is standing and who is seated. This is a quiet activity, so simply pay attention to your and colleagues' reactions.” 3. The trainer then fairly quickly reads the questions to the learners. For each statement, they stand up if their answer is yes. 4. After this, the trainer invites learners to share an experience of answering quick questions. This can offer you a good basis for an introduction to the machine learning topic.
<p>15 minutes</p>	<p>ACTIVITY: 1-2-4-ALL ON BASICS OF MACHINE LEARNING</p> <ol style="list-style-type: none"> 1. This activity will serve as an activator and a basis for further training. Explain the flow of the activity: First you will think solo, then in pairs, foursomes and finally all together. 2. Prepare a worksheet with three sections: SOLO, PAIRS, FOURSOMES, ALL. Ask learners an introductory question: <i>What do you think of when you hear the word machine learning? You can find the worksheet here (Link)</i> 3. SOLO (1 minute): Silent self-reflection by learners on the question we proposed, then writing down the main idea on the worksheet. 4. PAIRS (2 minutes): The group is then split into pairs. They generate ideas in pairs, building from their self-reflection. Write it down on the worksheet. 5. FOURSOMES (4 minutes): The pairs are now gathered into small groups of 4. They identify the similarities and differences between the ideas stemming from the pairs. This stage aims to share, filter duplicates, and feed the thought process by strengthening the agreements and discussing any differing points of view. 6. ALL (5 minutes): The foursomes then get together. Ask everyone: “So what is machine learning? <i>What are the main ideas from your discussions?</i>” Each group then shares their description of machine learning.

	<p>7. The trainer then summarises important findings and adds additional basic information on machine learning.</p> <p><i>*Tips for running this activity online in subchapter 3.2.2.</i></p>
<p>90 minutes</p>	<p>ACTIVITY: RESEARCHING MACHINE LEARNING TECHNIQUES AND EXAMPLES</p> <ol style="list-style-type: none"> 1. The trainer briefly presents all three machine learning techniques (deep learning, supervised learning, and unsupervised learning) with the help of 4.1.1. subchapter and basic briefings on machine learning. The trainer presents them shortly and simply. <i>10 minutes</i> 2. Learners are divided into 3 groups. Every group chooses a group representative. Each group has an A4 sheet, pens, and coloured markers. Learners should have their own smartphones with internet access, or we provide them with laptops with an internet connection. <i>5 minutes</i> 3. Each group draws one machine learning technique. The task of the group is to do research and prepare handouts for the specific technique. <i>30 minutes</i> <p>Handouts should include:</p> <ol style="list-style-type: none"> a. Definition of the technique. b. At least 2 concrete examples of the field of use. c. Interesting YouTube video relating to the chosen technique. Should be stimulating and short (maximum of 2 minutes). <ol style="list-style-type: none"> 4. Each group gives a presentation of their handouts (<i>3 x 10 minutes</i>). The presentation is made by a previously selected representative of the group. He/she presents the definition, examples of usage and plays a YouTube video. After each presentation, every group asks at least one question or gives feedback on the presentation (<i>3 x 5 minutes</i>). <i>Total of 45 minutes</i> <p><i>*Tips for running this activity online in subchapter 3.2.5.</i></p>
<p>15 minutes</p>	<p>Break</p>
<p>85 minutes</p>	<p>ACTIVITY: EXAMPLES OF HUMAN MACHINE INTERACTION</p> <ol style="list-style-type: none"> 1. The trainer prepares materials for examples of human machine interaction (interfaces, communication, control of devices, machines, computers, systems, and human-machine interaction combined with virtual reality, augmented reality or mixed reality) with the help of 4.1.2. subchapter and basic briefings on machine learning. 2. Each learner receives a worksheet, divided into four sections, with titles of examples of human machine interaction (interfaces/communication/control of devices, machines, computers, systems/human-machine interaction combined with virtual reality, augmented reality or mixed reality). Under each example, there is a space for the learner to write down definitions, descriptions, and facts after hearing the presentations of group work. 3. Learners are divided in 4 groups of 4 or a maximum of 5. Every group chooses a group representative. Each group receives materials about the specific example of human machine interaction (interfaces, communication, control of

	<p>devices, machines, computers, systems, and human-machine interaction combined with virtual reality, augmented reality or mixed reality). <i>5 minutes</i></p> <p>4. Learners use given materials and also other sources on the internet (they use their smartphones) to prepare an oral presentation about the example of human machine interaction they have received. They prepare key points that will be presented to other learners later. <i>30 minutes</i></p> <p>The presentation should include:</p> <ol style="list-style-type: none"> Definition. Description of at least 2 examples. Fun and interesting facts. <p>5. A group representative presents their findings in 5 - 10 minutes. After each presentation, invite other groups to ask questions or give feedback on the presentation. Trainer moderates the discussion and provides more details on the topic. <i>50 minutes</i></p> <p>6. All learners make notes for each presentation on the worksheet they received at the beginning of the activity. At the end, every learner has a filled worksheet with definitions, examples, and interesting facts for all 4 examples of human machine interaction.</p>
50 minutes	<p>ACTIVITY: FUTURE MAPPING ON EXAMPLES OF HUMAN MACHINE INTERACTION</p> <ol style="list-style-type: none"> Divide the wall into three equal sections. At the top of each section write: last year, this year, and next year to five years in the future. Give each learner a marker and sticky notes, then explain the aim of this activity: "We will, together, create a vision of the future, through the lens of the past and present. Think about significant trends, difficulties, and challenges for examples of human machine interaction. Help yourself with the handouts from previous activities. Write it on the sticky note, stick it up on the wall and read it out loud so other colleagues can hear. There is no need to wait, as soon as you come up with something, write it down and stick it up. The aim is to fill up the wall in the next 25 minutes." <i>25 minutes</i> When the time is up, divide learners into groups of 3. Each group gets a paper. Then invite groups to reflect on posts that are on the wall. Let them find some common patterns and ideas. <i>10 minutes</i> After that, run a group reflection and discussion (<i>15 minutes</i>): <ul style="list-style-type: none"> What patterns do we see looking at this timeline? Which trends are most important for me as an individual? Which trends are most important for me as a worker? Which trends are most important for the society as a whole to be aware of and learn more about? How do I feel about the past, present, and future? What does this mean for our team? My company? Our society? Point out some of the key themes that came up throughout the discussion. <p><i>*Tips for running this activity online in subchapter 3.2.3.</i></p>

4.2.3 CONCLUSION AND EVALUATION

Trainer asks learners the following questions:

1. Did this training session meet your expectations?
2. Highlight one thing you would change in this training flow. How?
3. What will you remember most from this training?
4. How will you transfer this knowledge into practice?
5. How has your perspective on machine learning and human interaction changed?
6. Think of something meaningful and important that was told in this training. Share.



4.3 RESOURCES ON MACHINE LEARNING AND HUMAN MACHINE INTERACTION

4.3.1 RESOURCES FROM THE PROJECT AIAE

- [Briefings](#): pages 19 to 34
- [Interviews](#): Interview 1: snippets 3 to 7, Interview 2: snippets 2 to 5, Interview 5: snippets 2 and 3, Interview 7: snippets 3 to 7
- Learning scenarios in the [toolkit](#): machine learning, human machine interaction
- Platform: <https://www.studio2b.de/aiae-en/>

4.3.2 MORE ABOUT MACHINE LEARNING

DEEP LEARNING

- Article about traffic prediction [http://Google Maps 101: How AI helps predict traffic and determine routes \(blog.google\)](http://Google Maps 101: How AI helps predict traffic and determine routes (blog.google))
- Deep learning vs. machine learning and how deep learning works. <https://www.ibm.com/cloud/learn/deep-learning>
- Article about DeepL translator. <https://www.dw.com/en/deepl-cologne-based-startup-outperforms-google-translate/a-46581948>
- A platform for photo colorisation of black and white photos using deep learning. <https://deepai.org/machine-learning-model/colorizer>

SUPERVISED LEARNING

- Illustrative examples of supervised learning [3 Examples of Supervised Learning - Simplicable](#)
- Video explaining supervised learning with examples (Time: 15:22). https://www.youtube.com/watch?v=4qVRBYAdLAo&ab_channel=CrashCourse
- Supervised vs. unsupervised learning. <https://www.ibm.com/cloud/blog/supervised-vs-unsupervised-learning>

UNSUPERVISED LEARNING

- Illustrative examples of unsupervised learning [3 Examples of Unsupervised Learning - Simplicable](#)
- Article about unsupervised Learning: definition, benefits and examples. <https://www.indeed.com/career-advice/career-development/unsupervised-learning>

- Article about real life applications of unsupervised learning. <https://pythonistaplanet.com/applications-of-unsupervised-learning/>

4.3.3 MORE ABOUT HUMAN MACHINE INTERACTION

INTERFACES

- Article about graphical user interface, uses with examples and advantages. <https://www.educba.com/what-is-gui/>
- Article about Head Orientation, gesture input and nostril mouse. <http://www.cs.man.ac.uk/~tmorris/IP6.html>
- Article about eye controlling computers with Tobii assailant. <https://blog.tobii.com/eye-tracking-windows-upcoming-windows-10-release>

COMMUNICATION

- Explaining Natural Language Processing (NLP) technology, what it does, tools and applications. <https://www.ibm.com/cloud/learn/natural-language-processing>
- Article explains how Siri work using Natural Language Processing (NLP) technology. <https://medium.com/mytake/natural-language-processing-ft-siri-2bc7b854a2a3>
- Article about voice-controlled home automation using AI and NLP. <https://www.ijarsct.co.in/Paper2328.pdf>
- Article about home technology, how it works and examples. <https://www.otelco.com/resources/smart-home-guide/>

CONTROL OF DEVICES, MACHINES, COMPUTERS, SYSTEMS

- Short article about control systems with examples. <https://www.computerscience.gcse.guru/theory/control-systems>
- Video about Open-Loop control systems (Time: 5:45). https://www.youtube.com/watch?v=FurC2unHeXI&ab_channel=MATLAB
- Article about two different types of control systems with examples. <https://electronicscoach.com/control-system.html>

HUMAN-MACHINE INTERACTION COMBINED WITH VIRTUAL REALITY, AUGMENTED REALITY OR MIXED REALITY

- Article about the human computer interaction and virtual reality lab in University of Peloponnese. <http://ceur-ws.org/Vol-2235/paper10.pdf>

- Article about human-machine interaction, virtual reality and human-computer interaction with practical examples and photos. <https://tweedegolf.nl/en/blog/3/vr-hmi-and-hci>
- 11 VR apps and films that let you travel the world from home. <https://www.oculus.com/blog/virtual-vacation-11-vr-apps-and-films-that-let-you-travel-the-world-from-home/>
- Article about using VR for treating mental disorder: phobia. <https://centerforanxietydisorders.com/virtual-reality-therapy-for-phobias/>





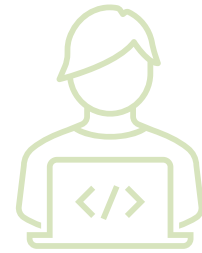
5

CHAPTER

AI TECHNOLOGIES AND
APPLICATION FIELDS OF AI

5.1 BASICS OF AI TECHNOLOGIES AND APPLICATION FIELDS OF AI

Artificial intelligence (AI) makes it possible for machines to memorise from experience, adjust to new inputs and perform human-like tasks. There are different types of technologies involved in the operation of AI, which are already broadly used in our society and in our daily lives. We will look at six different AI technologies that facilitate the development of the AI along with the fields of application of different AI technologies. People can be unaware that they are using AI in their daily lives, but once they become aware of it, the fear of using AI diminishes.



5.1.2 EXAMPLES OF AI TECHNOLOGIES

OBJECT OR IMAGE RECOGNITION

Object recognition uses algorithms in order for computers to recognise certain items, people, places, and activities in photos or videos. Object recognition consists of three steps: classification and localisation, detection and segmentation. The classification first identifies what is in the image and with what level of confidence, then localises the position of the object in the image. Detection follows when determining which object is in the image or video. In segmentation, objects are identified for each pixel in the image, resulting in a very detailed map of the image. For example, skin cancer can be identified with AI based on the pattern on the skin and comparison with the common pattern for skin cancer.

Where is object/image recognition used?

- **Automobile industry:** security, self-driving cars, applying traffic rules.
- **Healthcare industry:** diagnosing (tumour and cancer detection, CT, MRI, X-Ray), medical training (surgery simulation) and optimising the treatment.
- **Manufacturing:** identifying faulty parts, cybersecurity.
- **Retail:** self-service checkouts, inventory management and optimisations, shelf replacement, security and theft prevention.

FACE RECOGNITION

Face recognition is a computer technology that identifies human faces in images or videos. It is based on a biometric method that focuses on the frontal human face. The goal is to identify or verify the identity of individuals. Face recognition is a process consisting of four parts. The first phase is face detection, in which the camera locates and detects the human face. This is followed

by a face analysis phase, where the image is compared, based on the main characteristics (e.g., length between the eyes), with other images in databases. When the analysis is complete, the image is converted into a mathematical formula called a “faceprint”. In the last phase, the “faceprint” is compared to the database of the face recognition system and determines a match.

Where is face recognition used?

- **Device security:** unlocking mobile phones and computers.
- **Law enforcement:** identifying criminals, finding missing persons.
- **Airports:** biometric passport check-ins.
- **General identification verifications:** electoral registration, banking, identifying new-borns, national IDs and employee IDs.



*Ingrid: “Interesting data from the results of a study by the National Institute of Standards and Technology showed that in 2014 the **error of the algorithm for face recognition** was **4.1 %**. The results of the research in March 2020 showed an error of only **0.08 %**. However, we must not forget that technology is still fallible, and we must also address the ethical aspects and misuses of face recognition.”*

VOICE RECOGNITION



Voice recognition enables computers to identify a speaker with the use of specialised software, based on biometric evaluation of voice, such as frequency, flow, pitch and natural accent. The main goal is to identify the person speaking. The person’s voice is transformed into a digital signal that a computer can read. Afterwards a “voice template” is created by dividing words into segments. At last, the computer uses ‘this ‘voice template’ to compare and identify the speaker.

Where is voice recognition used?

- **Authentication:** voice verification.
- **Customer service:** verifying identity, personalised interaction.
- **Law enforcement:** identify criminals.



Oliver: "What if we get sick? In this case our voice is deeper and hoarse. Can voice recognition be misplaced then?"



Ingrid: "We know that our voice can change due to various factors, as you have mentioned, Oliver. Voice recognition can also be affected by background noise, traffic, music, weather, which changes the quality of the input and affects the results.

However, the companies behind voice recognition technology claim that a voiceprint contains more than 100 different physical and behavioural features of each individual, such as vocal tract length, nasal passage, tone, accent, and so on. They believe it is as unique to a person as a fingerprint, and that their systems can even tell if someone has a cold or a sore throat. But surely, there are some mistakes done by wrong voice recognition."

SPEECH RECOGNITION

Speech recognition allows us to talk to a computer or device, which interprets content in order to respond to us or perform specific tasks. Speech recognition is a multidisciplinary process which uses a combination of linguistic, mathematical and computing disciplines. Process involves four steps: converting human voice into digital data, dividing signal into short segments matched to known units of sound, evaluating and identifying them and lastly, programme identifying what the person is saying resulting in text or executing a command.

Where is speech recognition used?

- **Virtual assistant:** checking the weather, giving answers to questions, adding items on shopping lists.
- **Banking:** customer service.
- **Healthcare industry:** finding data quickly and hands-free, quick data input.
- **Education:** learning plans for disabled.
- **Workplace:** schedule meetings, enter data, draw graphs, find reports.

NAVIGATION

Navigation systems include location technology, digital maps and global positioning systems (GPS). Automobile navigation is one of the most used one, since almost every car nowadays has in-car navigation systems. A lot of companies are working on autonomous or driverless cars, which rely on a mix of hardware,



software, and sensors to construct a map of the automobile's surroundings and monitor the precise location of the car and objects around it.

Where is navigation used?

- **Automobile industry:** automobile navigation, self-driving cars.
- **Transportation:** analysing road traffic, optimising routes.

OBJECT MANIPULATION

Object manipulation allows the robot to communicate with the environment, and in this way perform human tasks such as touching, pushing or grasping. To mimic human dexterity, AI based on large datasets and scenarios, allow the system to learn at an accelerated rate. Robots can perform repetitive routine tasks on their own, while cobots are based on close collaboration with human workers to support them to complete a task.



Where is object manipulation used?

- **Manufacturing:** packing, assembly, welding, cutting.

5.1.2 APPLICATION FIELDS OF AI

EDUCATION

AI assists teachers in their teaching by increasing the efficacy of personalisation and automating assessment and evaluation. It also helps students with customised collaborative learning environments, assessment, chatbots and robot learning. Intelligent tutoring systems (ITS) with AI enhancements can provide personalised learning and coaching.

EXAMPLES: visual simulation, customised digital lessons, individualised schedules, 24/7 access to learning.

FINANCE

AI is involved in risk management and analysing a huge amount of data in order to be competitive in the market. It also plays an important role as a virtual assistant, debt underwriting, fraud detection and automatic trading processes. In the field of insurance, it is also a virtual assistant in customer profiling, simplification and process acceleration.

EXAMPLES: detecting credit card fraud, predictions of stock performance, customer chatbots for self-help.

HEALTHCARE SYSTEM

In the healthcare system AI helps with research, diagnosing and treatment plans for patients. AI is very beneficial because it can detect diseases in early phases, then also monitor patients' health. AI also helps in education with simulations and training cases.

EXAMPLES: X-Ray imaging, robotic surgeries, treatment plan for cancer, melanoma detection, treatment of contagious diseases, patient's data transfer.



Ingrid: "Instead of surgeons doing a complicated surgery on the patient for the first time, they can practice in advance with a simulation of the surgery. AI can surely save lives if used in an ethical way."

JUSTICE

AI in courts helps organise information, provides answers and predicts justice. Based on algorithms it can identify patterns in data, search for documents and also forecast justice decisions, which can be used as a decision support tool. It can improve the predictability of law, the consistency of court decisions as well as prevent discrimination.

EXAMPLES: 24/7 public legal information, contract review, chatbots/lawyer bots.

MANUFACTURING

In the manufacturing industry robots help in automation and efficiency of production. AI technology helps cut down on accidents and errors, maintain safe equipment with sensing malfunctions, but also enhance product quality control. AI is often used in customer service, for 24/7h support, but also recognise customer behaviour and predict future outcomes. In the long run, it turned out that AI is lowering operational costs.

EXAMPLES: robotics, product price forecast, personalised experience for customer service.

TRANSPORTATION

AI has a huge role in road, maritime and aviation transportation. For road traffic, it provides self-driving cars, traffic control and driver behaviour monitoring. In maritime transportation AI helps with predictive analytics, maintenance optimisation and ship navigation. In air transport AI helps as a virtual assistant for passengers, smart logistics and emission reduction.



EXAMPLES: Biometric face recognition passport, truck platooning, air traffic control, driverless vehicles, optimal route schedule, flight delay predictions, vehicle maintenance prediction.

5.2 EXAMPLE OF A TRAINING ON AI TECHNOLOGIES AND APPLICATION FIELDS OF AI

5.2.1 PREPARATION



Time: 8 pedagogical hours and breaks



Learners: Adult learners, who want to understand how AI works and can be applied.



Learning outcomes: After the training learners will be familiar with various AI technologies. They will understand different ways of how AI is incorporated in everyday life and work environments. Through discussion of the benefits and cons of application of AI into several fields, they will be able to better understand when AI supports them and society, which can reduce the potential fear of AI.



Methodology: icebreaker, group work, discussion, world cafe, presentations, learning from materials, self-reflection



Equipment: Whiteboard (or digital alternative like Jamboard), bigger sheets (or Padlet in an online version), projector, pens, colours, internet access as well as all learning materials printed or digital (specific chapters of the briefings, questions for the world cafe, etc.).



Preparation of the classroom: layout with bigger tables that enables group work in groups of 4-5 learners (breakout rooms in an online version), six A3 sheets with one AI technology listed on one sheet on the walls of the classroom.

5.2.2 IMPLEMENTATION

TIME	DESCRIPTION OF EACH ACTIVITY
15 minutes (the time might vary depending on the number of the participants)	<p>ICEBREAKER: "FAST CIRCLE"</p> <ol style="list-style-type: none"> 1. The trainer holds a small ball and explains the rules: "We will pass this ball around. When you catch it, tell us your name (if learners do not know each other). Then think of the workplace where you work or used to work. Which AI technologies are used in this workplace? Tell us about them in a few sentences when you receive the ball. Once you explain the technologies used in your workplace, pass the ball further on." 2. The trainer begins by setting an example, tells his/her name and lists technologies he/she uses in the workplace. Then he/she passes the ball further on to the next person. 3. The icebreaker finishes when all learners have had the ball.
75 minutes	<p>ACTIVITY: USAGES OF AI TECHNOLOGIES</p> <ol style="list-style-type: none"> 1. Before this activity, the trainer tapes six A3 papers with one technology listed on each paper in the classroom (padlet in an online version). The terms to be included on the sheets of paper are object or image recognition, face recognition, voice recognition, speech recognition, navigation and object manipulation. 2. The trainer shortly presents six AI technologies (object/image recognition, face recognition, voice recognition, speech recognition, navigation and object manipulation) with the help of 5.1 subchapter and basic briefings on AI technologies. The trainer can either present them frontally or ask learners about what they already know about the specific technology. Keep the explanation short and simple. <i>20 minutes</i> 3. Learners go from one paper to the next in the classroom and write down real examples of how each technology is used. The trainer can provide them with an example of Siri or Alexa as a speech recognition technology for easier understanding of instructions. <i>20 minutes</i>

	<ol style="list-style-type: none"> 4. When the learners are finished with writing examples, the trainer summarises the findings and examples written on each paper. <i>20 minutes</i> 5. Discussion about the widespread usage of the AI technologies in peoples' lives follows. <i>15 minutes</i>
15 minutes	Break
90 minutes	<p>ACTIVITY: DEEP DIVE IN THE APPLICATION FIELDS OF AI TECHNOLOGIES</p> <ol style="list-style-type: none"> 1. The trainer chooses application fields of AI technologies most relevant for the learners (examples with materials developed in the scope of the project: education, finance, healthcare system, justice, manufacturing, transportation). The trainer prepares materials for each of the chosen application fields. Aside from the chapters from basic briefings he can add more material that he finds useful. 2. Learners are divided in groups of 4 or maximum 5. They should choose a name and a leader of each group, who will take care of the reporting and organisation of work within the group. <i>5 minutes</i> 3. Each group receives materials about one specific application field of AI technologies (education, finance, healthcare system, justice, manufacturing, transportation or other), such as chapters from the briefings, articles, videos, interviews etc. Each group should have a unique application field of AI technologies. 4. Learners use given materials and also materials they find on their own to prepare a presentation about the application field of AI technologies they have received. They make a poster presentation, in which they will later present other groups their findings about their application field of AI. <i>30 minutes</i> <p>The poster should include at least next information:</p> <ol style="list-style-type: none"> a. Which AI technologies are used in this application field? b. 3 real examples of specific uses of AI technologies in this field. c. How do these technologies benefit this field? d. What are the threats of using these technologies in this field?

	<p>e. What did you find interesting when researching the materials?</p> <p>5. Each group presents their findings in 10 minutes. After each presentation, other groups can ask questions or comment on the presentation. The trainer moderates the discussion and provides more details regarding each application field.</p> <p><i>Approximately 50 minutes (depending on the number of groups)</i></p> <p>6. If possible, put the posters in visible places in the classroom. <i>5 minutes</i></p>
15 minutes	Break
90 minutes	<p>ACTIVITY: SELLER OR A ROBOT?</p> <ol style="list-style-type: none"> 1. Prepare and watch a video from Youtube: StrongPoint and Halodi are developing a grocery retail reshelving robot <i>5 minutes</i> 2. Discussion with learners follows. <i>25 minutes</i> <p>Possible questions a trainer can ask the learners:</p> <ol style="list-style-type: none"> a. What are the first thoughts that come into your mind after watching this video? b. Which AI technologies does this robot use? c. Imagine you are a customer in this store. How would you feel about the robot? d. Imagine you are a worker in this store. How would you feel about the robot? <ol style="list-style-type: none"> 3. After the discussion learners are divided into 2 equal groups. One group should find the benefits of having this robot in a store and the other should find the drawbacks of having this robot in a store. Each group has 15 minutes to prepare the arguments. <i>15 minutes</i> 4. After preparation each group has 10 minutes to present their arguments why the robot should or should not be in the grocery store to the other group. <i>20 minutes</i> 5. A group discussion regarding the benefits and drawbacks of implementing AI technologies into different working environments of the learners follows. The trainer moderates the discussion. <i>25 minutes</i>

15 minutes

Break

90 minutes

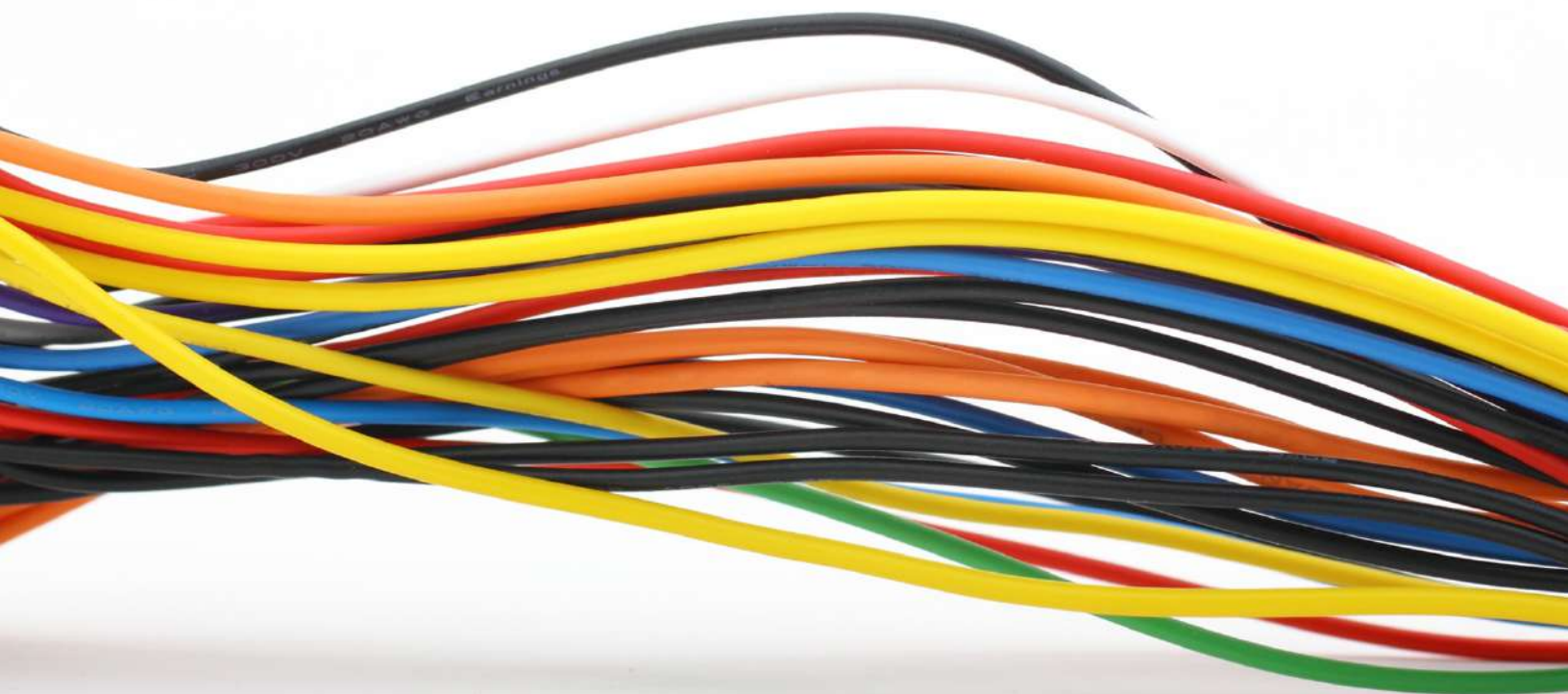
ACTIVITY: WORLD CAFE ON AI TECHNOLOGIES AND APPLICATION FIELDS OF AI

1. Divide learners into different groups than in previous activities. There should be a maximum of 5 learners in each group. Each group chooses a host of the table that will remain at the same table the whole time. *5 minutes*
2. Every group has its own table, at least three A3 or bigger sheets of paper, colourful pencils, markers and other materials they can use when working in groups.
3. The trainer provides the first question: *"Which AI technologies do you find the most useful for young people?"* It is recommended to have the questions written down somewhere on a visible spot.
4. Learners have 20 minutes to work on this question. When thinking about a specific question, they should write and draw on the paper on the table, to express their thoughts and ideas. *20 minutes*
5. After 20 minutes the host (1 person from the group) remains at the table, whilst others move to a new table. It does not matter where they go, as long as there are not more than 5 learners in one group. In 5 minutes, the hosts explain the findings of the previous group to the new group. *5 minutes*
6. After 5 minutes, the trainer presents the second question: *"How can AI technologies benefit working adults and/or parents?"* The newly formed groups have 20 minutes to work on this question. *20 minutes*
7. After 20 minutes, they change groups, only hosts remain at the same table. They present findings of the previous group to the new group in 5 minutes. *5 minutes*
8. The trainer presents the third question: *"Which AI technologies can be beneficial for older generations? In what way?"* Groups work 20 minutes on this topic. *20 minutes*
9. After the third question, all hosts present the most important findings of their table in all the three rounds to everyone. *15 minutes*
10. If possible, group discussion about the whole activity follows.

5.2.3 CONCLUSION AND EVALUATION

The trainer asks learners the following questions:

1. What were your favourite aspects of the training session?
2. What parts of the training session would you rather change? How?
3. What did you find the most interesting during today's training session?
4. How will you use this knowledge in practice?
5. How has your perspective of AI technologies and application fields changed?



5.3 RESOURCES ON AI TECHNOLOGIES AND APPLICATION FIELDS OF AI

5.3.1 RESOURCES FROM THE PROJECT AIAE

- [Briefings](#): pages 40 to 70
- [Interviews](#): Interview 1: snippet 2, Interview 3: snippets 2 to 6, Interview 5: snippet 4, Interview 7: snippet 2, Interview 8: snippet 2
- Learning scenarios in the [toolkit](#): education, finance, healthcare, justice, manufacturing, technologies, transportation
- Platform: <https://www.studio2b.de/aiae-en/>

5.3.2 MORE ABOUT AI TECHNOLOGIES

OBJECT RECOGNITION

Want to learn more?

- Difference between object localisation, detection and segmentation (examples and pictures included). <https://www.geeksforgeeks.org/object-detection-vs-object-recognition-vs-image-segmentation/>
- TED lecture on the mechanism of how a computer learns to recognise objects with a neural network programme for training and testing computer vision models. (Time: 7:37). https://www.youtube.com/watch?v=Cgxsv1riJhl&ab_channel=TED
- Article about what is object recognition, how it works, history of it, application fields and future recommendations. <https://viso.ai/deep-learning/object-detection/>

Fields of application

- Examples of image recognition and object detection in stores (pictures included). <https://www.kdnuggets.com/2020/03/image-recognition-building-perfect-store.html>
- How image recognition is involved in car accident prevention in the automobile industry. <https://innovationmanagement.se/2019/10/04/how-image-recognition-is-transforming-the-automobile-industry/>

FACE RECOGNITION

Want to learn more?

- Breaking 8 common myths associated with facial recognition technology. <https://www.securityindustry.org/wp-content/uploads/2019/06/facial-recognition-20193.pdf>

Fields of application

- Video about airport's facial recognition of biometric passports (Time: 3:59). https://www.youtube.com/watch?v=RAHzT68l6tM&ab_channel=WallStreetJournal
- Different fields of applications of facial recognition supported by concrete examples of companies. <https://www.kaspersky.com/resource-center/definitions/what-is-facial-recognition>

VOICE RECOGNITION

Want to learn more?

- Definition of voice recognition, voice vs. speech recognition and types of voice recognition. <https://recfaces.com/articles/what-is-voice-recognition#3>
- Difference between speech and voice recognition, with examples. <https://www.kardome.com/blog-posts/difference-speech-and-voice-recognition>

Fields of application

- Future of voice recognition in banking. <https://www.bbva.com/en/voice-biometrics-the-voice-print-will-become-online-bankings-greatest-ally/>
- Description of Interpol's Speaker Identification Integrated Project (SIIP) – YouTube animation video included (Time: 2:01). <https://www.interpol.int/Who-we-are/Legal-framework/Information-communications-and-technology-ICT-law-projects/Speaker-Identification-Integrated-Project-SIIP>

SPEECH RECOGNITION

Want to learn more?

- Types of speech recognition, history, advantages and disadvantages, fields of applications, and examples of speech recognition software. <https://recfaces.com/articles/what-is-voice-recognition#3>

- Fields of application of speech recognition, examples of software, step-by-step description of processes of speech recognition and an explanation on how Alexa works (Time: 6:23). https://www.youtube.com/watch?v=6altVgTOf9s&ab_channel=Acadaimy

Fields of application

- Applications of speech recognition in the healthcare industry and its challenges. <https://codeit.us/blog/speech-recognition-in-healthcare>
- Benefits of speech recognition technology when remote working. <https://www.techtarget.com/searchunifiedcommunications/answer/How-can-speech-recognition-technology-support-remote-work>

NAVIGATION

Want to learn more?

- Role of artificial intelligence in the Global Navigation Satellite System. <https://www.madrasresearch.org/post/roles-of-artificial-intelligence-and-machine-learning-in-gnss-positioning>
- Challenges of mapping technology. <https://techwireasia.com/2021/07/perfecting-mapping-with-ai-and-machine-learning/>
- Article about ORCA AI system which helps with navigation of ships. https://ship.nridigital.com/ship_yearbook_19/using_ai_to_navigate_the_tricky_topic_of_ship_navigation

Fields of application

- Artificial intelligence in the development of driverless navigation. <https://technative.io/artificial-intelligence-taking-driverless-navigation-up-a-gear/>
- Route optimisations in the field of logistics. <https://www.redwoodlogistics.com/route-optimization-is-being-revolutionized-thanks-to-ai/>
- Example of vessel collision risk reduction AI model at one of the world's busiest ports in Singapore (video and infographic included). <https://www.fujitsu.com/global/solutions/business-technology/ai/articles/safe-vessel-navigation.html>

OBJECT MANIPULATION

Want to learn more?

- Article describes how AI is implemented in robotics with examples. It also emphasises the importance of distinguishing between robotics and AI. https://aibusiness.com/author.asp?section_id=789&doc_id=773741
- Video about ManipulaTHOR, a framework that facilitates visual manipulation of objects using a robotic arm (Time: 3:00). <https://www.youtube.com/watch?v=nINZ52nlzX0&t=3s>

Fields of application

- Examples of robotic object manipulation in the field of industry. <https://www.jabil.com/blog/ten-popular-industrial-robot-applications.html>
- Example of robot technology in retail (Time: 3:18) https://www.youtube.com/watch?v=GWwDrcyy8k0&ab_channel=PromobotRussia
- Video of robots playing the guitar, the piano, the drums and mixing music (Time: 4:15). <https://www.youtube.com/watch?v=bAdqazixuRY>

5.3.3 MORE ABOUT FIELDS OF AI APPLICATION

EDUCATION

- Video about the role of AI in education to make learning a better experience (Time: 4:33). <https://www.youtube.com/watch?v=xW1jg1UiVwo&t=7s>
- Article describes differentiated and individualised learning, universal access to learning content, automate admin tasks, tutoring and support outside the classroom. <https://bernardmarr.com/how-is-ai-used-in-education-real-world-examples-of-today-and-a-peek-into-the-future/>

AGRICULTURE

- Article describes virtual sommelier, wine shop assistant, and different techniques of AI applied to help increase quality of wine production. <https://futuresdrinksexpo.com/en/blog/insights-64/how-ai-will-revolutionize-the-future-of-wine-251.htm>
- Electronic nose for detecting gases in beer aromas and robot who pours the perfect beer. <https://medium.com/mathworks/making-better-beer-and-wine-with-data-and-machine-learning-dd04459f53b7>

FINANCE

- More about AI in the finance field with specific examples. <https://www.avenga.com/magazine/artificial-intelligence-machine-learning-finance/>
- 20 examples of AI in finance. <https://builtin.com/artificial-intelligence/ai-finance-banking-applications-companies>
- Accountability, risk management and the importance of regulation in the context of finance. <https://sfmagazine.com/post-entry/august-2021-teaching-ethics-and-ai-for-finance/>

HEALTHCARE SYSTEM

- Article about an algorithm that identifies the best treatments for various subtypes of cancer. <https://hai.stanford.edu/news/using-ai-personalize-cancer-care-0>
- AI applications in medicine and benefits of it. <https://www.ibm.com/topics/artificial-intelligence-medicine>

JUSTICE

- Technologies and applications of LegalTech and the difference between LegalTech and LawTech. <https://www.intellectsoft.net/blog/what-is-legaltech/>
- Public safety video and image analysis, DNA analysis, gunshot detection, crime forecasting and future applications of AI in criminal justice. <https://www.ojp.gov/pdffiles1/nij/252038.pdf>

MANUFACTURING

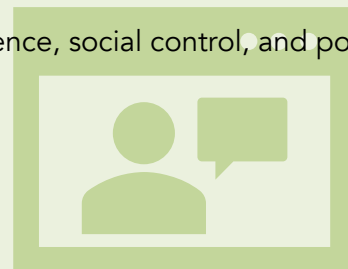
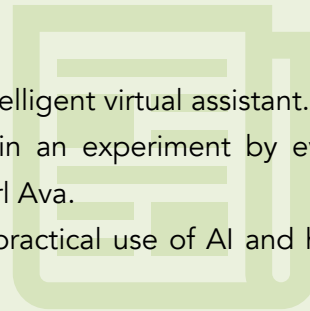
- Examples of chatbot uses in the manufacturing field. <https://www.orai-robotics.com/post/ai-chatbot-for-manufacturing>
- Examples of AI uses in the manufacturing field, including pictures and a Youtube video about how industry can save costs with AI. <https://research.aimultiple.com/manufacturing-ai/>
- Audi uses an AI vision system to identify cracks in the sheet metal from its press shop. <https://www.audi-mediacycenter.com/en/press-releases/audi-optimizes-quality-inspections-in-the-press-shop-with-artificial-intelligence-10847>

TRANSPORTATION

- Practical uses of AI in transportation; autonomous vehicles, passenger transportation, smartphone apps, traffic management, law enforcement, delay predictions, drone taxis. <https://zesium.com/practical-use-of-a-i-in-transportation/>
- AI in scheduling and the operation of public buses in Dubai. <https://gulfnews.com/uae/transport/video-rta-uses-artificial-intelligence-to-improve-bus-services-in-dubai-1.80875521>
- England's highway transport plan optimisation. <https://luca-d3.com/artificial-intelligence-examples/highways-england-insights>
- Addressing the issue of driving licence with self-driving cars. <https://www.how-2-drive.com/self-driving-cars-need-driving-licence/>
- In-depth description of AI involvement in road, aviation, railway and shipping transportation. [https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/635609/EPRS_BRI\(2019\)635609_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2019/635609/EPRS_BRI(2019)635609_EN.pdf)

MOVIES ABOUT AI

- **Her (2013)**. Man falling in love with an artificially intelligent virtual assistant.
- **Ex Machina (2014)**. Programmer is participating in an experiment by evaluating the human qualities AI, housed in the body of robot girl Ava.
- **Coded Bias (2020)**. Documentary that shows the practical use of AI and how it affects people in the real world.
- **Source Code (2011)**. A soldier wakes up in someone else's body and discovers he's part of a government programme to find the bomber of a commuter train.
- **The Social Dilemma (2020)**. Documentary that explores the dangerous human impact of social networking on society as a whole.
- **iHUMAN (2019)**. A documentary on artificial intelligence, social control, and power.



The background features several overlapping silhouettes of human heads in profile, facing right. These silhouettes are filled with a crumpled paper texture, giving them a tactile, organic appearance. The silhouettes are rendered in a light gray color against a slightly darker gray background. A large, dark green number '6' is superimposed over the center of the image, partially overlapping the crumpled paper heads.

CHAPTER

AI PERCEPTIONS, ETHICS AND SOCIETAL CHALLENGES

6.1 BASICS OF AI PERCEPTIONS, ETHICS AND SOCIETAL CHALLENGES

Artificial intelligence (AI) is shaping the world at an astonishing pace. Not only is AI a game changer for the IT experts sitting in Silicon Valley, it has brought significant changes into the everyday life of every one of us. It has a powerful impact on all sectors of the society, and has transformed the way we interact with one another.

AI is already a part of our world, and it is going to become increasingly important in the next decades. However, there is still a variety of discussions concerning how we shall engage with AI – and many open questions that yet need to be answered. In this chapter, we will provide training materials and guidelines to cover three themes: AI perception, ethics and bias in AI, and societal challenges concerning AI.



6.1.1 AI PERCEPTION

What do you think about AI? Do you consider it to be an opportunity for improvement, or rather a threat to society? In this section, you will find a theoretical framework of key concepts, a few case studies as examples, and a list of further questions for discussion.

THEORETICAL BASES AND KEY CONCEPTS

Key concept: Technology: an instrument of human beings?



Aristotle (among many other philosophers in Ancient Greece) considered technology to be an arrangement of techniques to serve a purpose for human beings. The term “techne” in ancient Greek is meant to describe “craft”, the capacity of making progress, of helping something to come into being – but not creating new beings on its own.

Martin Heidegger discussed the impact of technology in our society in his book “The Question concerning Technology”, which was published first in 1954. He considered technology to be a way of seeing the world, and criticised the contemporary use of technology as forcing the will of human beings on nature. Heidegger believed that the misuse of technology could be a real danger to this world.

Key concept: Autonomy

Autonomy is the state or condition of self-governance. In the application of AI, autonomy and autonomous decision-making are often found in the centre of some of the most heated debates. Kant shaped the conceptions of autonomy more than any other philosophers in the 18th century. For Kant, human beings are only able to make fully autonomous decisions when there is no influence by any external or inessential factors. However, as long as a person is able to recognise his or her intrinsic value of relationality, this person is still capable of making decisions autonomously.



Ingrid: “External or inessential factors? Does it mean we can only be autonomous when we are not influenced by the opinions of other people, or even by the belief or desire of our own? Oh, I am afraid I can never make it!”



Oliver: “That’s right, it is quite a challenge. Maybe that’s why rationality is important, to make sure we are still able to make autonomous decisions, in spite of what our friends tell us, or what we are secretly planning for ourselves!”

John Stuart Mill’s view of autonomy is rather the opposite. He argued that a person is autonomous when he or she is able to act in accordance with the inner values or desires. A much more realistic view of autonomy, which is also more influential in the application of technology. When we discuss the question of autonomy in the context of AI, we shall remember that even

the “conservative” definition of autonomy has also taken the external and inessential factors into consideration. An autonomous decision does not mean it is free from other influences.

CASE STUDIES / EXAMPLES

- AI as virtual assistant

Google Assistant: Google Assistant is an AI-powered virtual assistant developed by Google that is primarily available on mobile and smart home devices.

Users primarily interact with the Google Assistant through natural voice, though keyboard input is also supported. In the same nature and manner as Google Now, the Assistant can search the Internet, schedule events and alarms, adjust hardware settings on the user's device, and show information from the user's Google account. Google has also announced that the Assistant will be able to identify objects and gather visual information through the device's camera, and support purchasing products and sending money.

Alexa Assistant: Amazon Alexa, also known simply as Alexa, is a virtual assistant AI technology developed by Amazon.

It is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts, playing audiobooks, and providing weather, traffic, sports, and other real-time information, such as news. It uses NLU (natural language understanding), speech recognition and other weak AI to perform these tasks.

So, when you ask Alexa, “What’s the weather going to be like today,” the device records your voice. Then that recording is sent over the Internet to Amazon’s Alexa Voice Services which parses the recording into commands it understands. Then, the system sends the relevant output back to your device. When you ask about the weather, an audio file is sent back and Alexa tells you the weather forecast without you having any idea there was any back and forth between systems. What that of course means is that if you lose the internet connection, Alexa is no longer working.





Ingrid: "I have Alexa at home, too! I talked to her all the time, you can ask all kinds of questions to her and have a real conversation. But I must admit, most of the time I just ask her to put on music for me. I also like using AI assistants, like the service robots at my bank, where I can ask questions about my account and get an answer immediately."



Oliver: "I have seen these robots, too. In the city hall for example, it used to take months until we could get an appointment to register your address or apply for a car licence, but now with the Chatbot "Bobbi", everything gets much faster. But is this really safe? I wish I knew who has access to all my data and whether they are really protected."

- AI in maps and navigation

AI in Google Map and Navigation: Teaching Maps to identify and forecast when people are hitting the brakes

AI is a critical part of what makes Google Maps so helpful. With it, Google is able to map roads over 10 times faster today than five years ago, and Google Map can bring maps filled with useful information to virtually every corner of the world.

Google uses AI and navigation information to identify hard-braking events — moments that cause drivers to decelerate sharply and are known indicators of car crash likelihood — and then suggest alternate routes when available. These updates have the potential to eliminate over 100 million hard-braking events in routes driven with Google Maps each year.



But how exactly does Google find out when and where these moments are likely to occur? That's where AI comes in. Google trains machine learning models on two sets of data. The first set of information comes from mobile phones using Google Maps. And the second set is the information from routes driven with Google Maps when it's projected on a car's display, like

Android Auto. Training the models on both sets of data makes it possible to spot actual deceleration moments from fake ones, making detection across all trips more accurate.

Understanding spots along a route that are likely to cause hard-braking is just one part of the equation. Google is also working to identify other contextual factors that lead to hard-braking events, like construction or visibility conditions. For example, if there's a sudden increase in hard-braking events along a route during a certain time of day when people are likely to be driving toward the glare of the sun, the AI system could detect those events and offer alternate routes. These details inform future routing so that Google Map can suggest safer, smoother routes.

Further example of AI in navigation



We are all familiar with the “classic” navigation of Google. By collecting more details about their routes (lane counts, parking spots, bicycle lanes, etc.) the navigation system can help the drivers to find their way in unfamiliar locations. However, creating such detailed maps is an expensive, time-consuming process done mostly by big companies, such as Google, which sends vehicles around with cameras strapped to their hoods to capture video and images of an area’s roads. Because this process is expensive, however, some parts of the world are ignored.

A model invented by researchers at MIT and Qatar Computing Research Institute (QCRI) is set to fill in the blanks, a new solution that unleashes machine-learning models on satellite images to automatically tag road features, which are easier to obtain and updated fairly regularly. The MIT and QCRI researchers refer to their model as “RoadTagger”, which uses a combination of neural network architectures to automatically predict the number of lanes and road types (residential or highway) behind obstructions.

Qatar, where QCRI is based, is “not a priority for the large companies building digital maps”, says Sam Madden, a professor in the Department of Electrical Engineering and Computer Science (EECS) and a researcher in the Computer Science and Artificial Intelligence Laboratory (CSAIL). Yet, it’s constantly building new roads and improving old ones, especially in preparation for hosting the 2022 FIFA World Cup. It is therefore the goal of the whole team to automate the process of generating high-quality digital maps, so they can be available in any country.

- AI as driving assistant

Tesla: Autopilot and Full Self-Driving Capability

As the leading provider in the field of self-driving vehicles, every single car Tesla produces comes with the autopilot system. Autopilot is an advanced driver assistance system, and when used properly, Autopilot reduces the overall workload as a driver. Each new Tesla vehicle is equipped with eight external cameras and vision processing to provide an additional layer of safety. All vehicles built for the North American market now use the camera-based Tesla Vision to deliver Autopilot features, rather than radar.

Autopilot and Full Self-Driving Capability are intended for use with a fully attentive driver, who has their hands on the wheel and is prepared to take over at any moment. While these features are designed to become more capable over time, the currently enabled features do not make the vehicle autonomous.

However, in practice, it has not always been a smooth ride for Tesla. In Germany, there are a number of lawsuits from consumers, asking for compensation resulting from malfunction of Autopilot. In the summer of 2020, a court in Munich concluded that Tesla had misled consumers by promising its customers that its Autopilot feature was more capable than it actually was. In 2022, the Darmstadt Regional Court heard how the plaintiff had ordered his German-spec Model 3 with the optional Full Self Driving package at a cost of €6,300 (\$7000), and was thoroughly unimpressed with its autonomous capabilities.

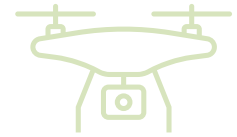
The owner claimed that the automatic overtaking function didn't work, that the car would not recognise traffic lights and stop signs, and likened the Tesla's steering behaviour at the entrances and exits of motorway intersections to that of a "drunk novice driver." The court awarded the Tesla Model-3 owner €69,000 (\$76,800) in compensation after deciding that the car's optional autonomous driving technology didn't live up to the marketing promise.



- Autonomous weapons

The U.S. is alarmingly close to an autonomous weapons arms race: we may enter a period of escalation that recalls the nuclear arms race between the U.S. and the former Soviet Union during the Cold War.

Autonomous weapons systems and military robots are progressing from science fiction movies to designers' drawing boards, to engineering laboratories, and to the battlefield. These machines have prompted a debate among military planners, roboticists, and ethicists about the development and deployment of weapons that can perform increasingly advanced functions, including targeting and application of force, with little or no human oversight.



Some military experts hold that autonomous weapons systems not only confer significant strategic and tactical advantages in the battleground but also that they are preferable on moral grounds to the use of human combatants. In contrast, critics hold that these weapons should be curbed, if not banned altogether, for a variety of moral and legal reasons.

However, when it comes to regulations, the U.S. military is rather hesitant. In a recent report from the Washington Post, officials from the U.S. military insist that "concerns are overblown", and humans can effectively control autonomous weapons. When we take a closer look at the battleground in Syrian and Libyan civil wars, autonomous weapons that make their own decisions are already killing people by the dozens.



Ingrid: "If we all use autonomous weapons in the future, do we still need any soldiers? Perhaps all the wars would be only machine-to-machine fights? Then there will be fewer casualties on the battleground, which will be a positive development!"



Oliver: "I am very sceptical about such a future. We need to make sure that the autonomous weapons will be very precise, and they should have advanced navigation to avoid civilians. Warzone without soldiers? Not necessarily. The power of the soldiers can also be enhanced by AI weapons, and perhaps soldiers will be

able to perform tasks that they are not able to do today."

FURTHER QUESTIONS / OPEN DISCUSSION

Autonomous driving and autonomous vehicles:

- What are the advantages of autonomous driving? And what might be the problems?
- What is “partial autonomous” and “fully autonomous”? What is your understanding?
- When we discuss autonomous driving and autonomous vehicles, who shall take the responsibility?
- Who/what is being transported by autonomous vehicles?
- What does autonomous driving and autonomous vehicles mean for: ownership of vehicles, driving schools, drivers as an occupation, traffic regulation, and legal regulation, etc.?

Autonomous weapons: are autonomous weapons really autonomous?

- What are the advantages of autonomous weapons? And what might be the problems?
- What is “partial autonomous” and “fully autonomous” when it comes to weapons?
- How to understand the statement from the Pentagon that “humans will always be in control of AI weapons”?
- Where are autonomous weapons being used these days?
- Who takes the responsibility?
- What does this mean for: officials/operators/generals, soldiers and civilians, regulation and international laws, the production and supply of such weapons, and the engineers who program the software?

6.1.2 ETHICS AND BIAS IN AI

THEORETICAL BASES AND KEY CONCEPTS

Key concept: Ethics

Ethics, also often referred to as moral philosophy, is the discipline concerned with what is morally good or bad, morally right or wrong. It essentially deals with the questions of how we should live, how we make decisions, both as individuals and a society, and how we take responsibility for others and the generations to come.

There have been numerous efforts to establish rules in ethics. From the code of Hammurabi to the world of Greek mythos, and the century-long debates in all major religions. However, the vast majority of such inquiries focus on human behaviour in the society. It has now become increasingly important and urgent to evaluate morality in the application of artificial intelligence. Does our moral compass apply for the conduct of artificial intelligence? How do we understand the issues of responsibility and accountability in the field of artificial intelligence? And in the end,

how do we as human beings interact with artificial intelligence and how can we make sure that artificial intelligence is acting morally, as well?

Key concept: Bias

Bias is the action of supporting or opposing a particular person or issue in an unfair way, because of allowing personal opinions to influence the judgement (Cambridge Dictionary). In other words, bias is the attitudes or stereotypes we possess – often unconsciously – that have a direct impact on our understanding, decision and actions. In many disciplines like philosophy or psychology, bias is identified as “explicit bias” and “implicit bias”, depending on whether the person is aware of the origin of his/her point of view. However, in practice it is often difficult to draw a clear line between these two types of bias, and it can be misleading.

When it comes to artificial intelligence, the question of bias becomes particularly interesting, since human beings are not always the ones to make the decision. Artificial intelligence is designed to be able to learn on its own and make decisions autonomously based on the data available. Artificial intelligence absorbs patterns of data to learn to make decisions, and it is therefore very difficult to separate an inner logic from an inherited stereotype. How shall we understand the issue of bias better in the application of artificial intelligence? How can we prevent artificial intelligence from acting on bias? And what does this tell us about the nature of bias and the process of making a decision?

CASE STUDIES / EXAMPLES

- Recruitment programme of Amazon

In 2018, Reuters reported that Amazon had been working on an AI recruiting system designed to streamline the recruitment process by reading resumes and selecting the best-qualified candidate. Unfortunately, the AI seemed to have a serious problem with women, and it emerged that the algorithm had been programmed to replicate existing hiring practices, meaning it also replicated their biases.



The AI system picked up on uses of “women’s” such as “women’s chess club captain” and marked the resumes down on the scoring system. Reuters learned that “In effect, Amazon’s system taught itself that male candidates were preferable.” Rather than helping to iron out the biases present in the recruitment process, the algorithm simply automated them. Amazon confirmed that they had scrapped the system, which was developed by a team at their Edinburgh office in 2014. None of the engineers who developed the algorithm wanted to be identified as having worked on it.

- Racist healthcare in the US

In 2018 a team from University of California Berkeley discovered a problem with an AI system that was being used to allocate care to 200 million patients in the US, which resulted in black patients receiving a lower standard of care. Across the board, black people were assigned lower risk scores than white people, despite the fact that the black patients were also statistically more likely to have comorbid conditions and thus in fact experience higher levels of risk. This in turn meant that black patients were less likely to be able to access the necessary standard of care, and more likely to experience adverse effects as a result of having been denied the proper care.

The problem stemmed from the fact that the system was allocating risk values using the predicted cost of healthcare as the determining variable, and because black patients were often less able to pay or were perceived as less able to pay for the higher standard of care, the AI essentially learned that they were not entitled to such a standard. Having made this discovery, the UC Berkeley team worked with the company responsible for developing the tool to find variables other than cost through which to assign the expected risk scores, reducing bias by 84%.



- Prediction of Crime in the US

COMPAS (which stands for Correctional Offender Management Profiling for Alternative Sanctions) is an algorithm used in state court systems throughout the United States. It is used to predict the likeliness of a criminal reoffending; acting as a guide when criminals are being sentenced. Propublica analysed the COMPAS software and concluded that “it is no better than random, untrained people on the internet”. Equivant - the company who developed the software - disputes the programme’s bias. However, the statistical results the algorithm generates predict that black defendants pose a higher risk of reoffending than a true representation, while suggesting that white defendants are less likely to reoffend. Black defendants were almost twice as likely to be misclassified with a higher risk of reoffending (45%) in comparison to their white counterparts (23%).



Oliver: “I can think of so many more examples where AI applications turn out to be biased - and this definitely happens across Europe, as well! AI technologies learn from the data we feed them. If AI performs in an unethical way, it is first because the data we have right now already include biased patterns. In another word, AI does not create these problems, it rather reflects these problems from our society very realistically. What’s important is for AI engineers to acknowledge these problems and address them effectively before they are multiplied and intensified through the technology.”

- AI as an alternative solution to triage in the battle field

The Defense Advanced Research Projects Agency (DARPA) is the innovation arm of the U.S. military. Founded in 1958 by President Dwight D. Eisenhower, DARPA is among the most influential organisations in technology research, spawning projects that have played a role in numerous innovations, including the Internet, GPS, weather satellites and, more recently, Moderna's coronavirus vaccine.



Currently, DARPA is aiming to answer some thorny questions by outsourcing the decision-making process to artificial intelligence in the battlefield. In war zones like Syria, Libya and Ukraine, mass casualty can be

particularly daunting for people who are working in the field and are forced to make tough decisions of triage. Hundreds of people need immediate medical care, but the hospitals nearby have limited capacity – how to make such decisions within a very short time? Through a new programme, called In the Moment, DARPA wants to develop technology that would make quick decisions in stressful situations using algorithms and data, arguing that removing human biases may save lives, according to details from the programme's launch this month.

The programme, which will take roughly 3.5 years to complete, could help identify all the resources a nearby hospital has — such as drug availability, blood supply and the availability of medical staff. Matt Turek, a programme manager at DARPA in charge of shepherding the programme, said the algorithms' suggestions would model "highly trusted humans" who have expertise in triage. But they will be able to access information to make shrewd decisions in situations where even seasoned experts would be stumped.

Similar to DARPA, other teams are working on various AI programmes to create digital triage assistants in the time of crisis. NATO is currently working with Johns Hopkins University to provide AI-based digital solutions for NATO-member states. The NATO triage assistant will use NATO injury data sets, casualty scoring systems, predictive modelling, and inputs of a patient's condition to create a model to decide who should get care first in a situation where resources are limited.



Ingrid: "I have read about an interesting project called "Event 201" in 2019, where researchers demonstrate the scenario of a global pandemic by computer simulation, using a number of AI technologies. It also addresses the importance of AI-based solutions for disaster management strategy, such as a potential triage."



Oliver: "In 2019? Right before the Covid Pandemic?! I hope with the lessons we have learnt through this pandemic, we can invest more resources into AI technologies in the health sector. As we have all seen, we need a global solution for such a global challenge, and AI technology can perform crucial tasks during a time of crisis."

FURTHER QUESTIONS / OPEN DISCUSSION

In the time of on-going war affairs and global pandemic, many consider AI-based solutions to be a solid alternative to the conventional man-power triage decision-making process. Do you agree?

- How much responsibility is AI given to make life-death decisions?
- Who decides on the database and the design of an algorithm for AI – with what consideration?
- Can an AI-Assistant make an autonomous decision in the situation of triage? Shall we support the AI-Assistant to make an autonomous decision, or shall we make sure there is additional supervision from human beings?
- How to detect and reduce the bias in the algorithm of AI? And how to make sure the bias in AI is being controlled and corrected?
- Thinking about the pandemic we just went through / are still going through, what kind of AI-based support can you imagine? And what kind of impact these AI tools might have?

6.1.3 SOCIETAL CHALLENGES CONCERNING AI

THEORETICAL BASES AND KEY CONCEPTS

Key concept: Data protection

It is increasingly common for companies to integrate artificial intelligence into their business operations. Many companies use AI to analyse data sets, enable predictions of customer behaviours, mimic human decision-making or categorise vast, highly complicated sets of information, among other functions. However, although AI can be a powerful asset, it can also present a threat to data privacy and data security, and raise issues with regulation. How can

companies use AI to improve their business operations while also prioritising user privacy and data protection?

The operation of AI relies on the collection and the analysis of data – an enormous amount of data. The more data a business needs, the more urgent it is to ensure transparency. It is not only about protecting the sensitive information of private citizens, but also preventing oppressive analysis of data to eliminate potential abuse of private information as well as biased outcome of AI application. Companies need to take responsibility for data protection and user protection, and here it is crucial to introduce and implement data privacy regulation.

Fortunately, the EU has already established the General Data Protection Regulation (GDPR) to address this issue. In 2021 the European Commission proposed the Artificial Intelligence Act to govern the development, marketing and use of AI in the EU, to broadly “harmonise rules on artificial intelligence”.



Key concept: Universal basic income

With the rapid technological advancement in recent years, more political debates start to focus on a potential economic transformation in the next decades, particularly as a result of the wide application of AI. As automation becomes increasingly standardised in industry, Forbes predicts that by 2030, 375 millions jobs will be lost worldwide due to automation (73 million in the US and 17 million in Germany). To avert an economic and social crisis from mass unemployment, not only is a transformation of economic structure on the horizon, but also a radical social reform. And one of the most frequently discussed proposals is universal basic income (UBI), especially since it was introduced by Andrew Yang in his presidential campaign of 2020 in the US.

Many European countries are debating the idea of a basic income, as well. A citizens' initiative has now called on the European Commission in 2021 to present a proposal for unconditional basic income throughout the union. The idea is to reduce regional differences, while strengthening economic and social cohesion across the continent. What is particularly important about the UBI is that it is not about keeping people on the payroll without working, but rather providing people with the stability and security to learn new skills and transit themselves smoothly through the economic transformation.



Oliver: "Of course this is something I worry about: will I be replaced by a robot someday and lose my job? There are so many tasks where machines can perform far better than human-beings. I am not sure whether I should be happy about the rapid development of AI or rather concerned about my own future."



Ingrid: "Don't you worry about that! AI will replace many jobs, but it also creates new jobs and new opportunities. I read that AI will create 58 million new jobs in the next 10 years, besides tremendous opportunities of on-the-job training for current employees to work better with AI technologies. Maybe in the future children will no longer dream to be a train driver, but many will aim to be an AI-Engineer for trains!"

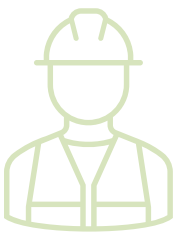
CASE STUDIES / EXAMPLES

- Facebook: AI and hate speech

Facebook has become the target of numerous debates when it comes to regulating hate speech on social media, and it has been heavily criticised for its lack of action. On the one hand, due to the latest technology in AI and the massive data collection from its users over the years, Facebook is able to understand the personal interests and preferences of billions of users, and feed them with the matching set of information to strengthen their points of view. While on the other hand, Facebook claims that it has invested heavily in AI to detect hate speech on its platform and has developed mechanisms to "clean up" the platform automatically.

However, based on the internal documents from Facebook, the Wall Street Journal reported that the AI technology Facebook relied on for the "clean-up" failed to deliver the expected results. "Facebook's AI can't consistently identify first-person shooting videos, racist rants and even, in one notable episode that puzzled internal researchers for weeks, the difference between cockfighting and car crashes."

- AI and Robotics as a threat or a chance to transform the job market in Germany



Automation is a big concern in modern societies in view of its widespread impact on many socio economic issues including income, jobs, and productivity. A research in 2017 examines the impact of robots in the labour market in Germany, and concludes that Robots have had no aggregate effect on German employment, and robot exposure is found to actually increase the chances of workers staying with their original employer. This effect seems to be largely down to efforts of work councils and labour unions, but is also the result of fewer young workers entering manufacturing careers.

For the sector of manufacturing: although robots do not affect total employment, they do have strongly negative impacts on manufacturing employment in Germany. However, Germany is not only a heavy user of robots, but also an important engineer of industrial robots. While many jobs will be replaced by AI-powered technology, there is a simultaneous growth of jobs in the sector of machine engineering. Overall, the research shows that although German manufacturing firms deploy robots, they don't displace existing workers, although many of them learn to perform different tasks.

FURTHER QUESTIONS / OPEN DISCUSSION

Generally, we need to address the question of responsibility in the application of AI (AI in driving, in war zones, in triage, etc.) and the question of autonomy.

And we should also consider the economic and social transformation triggered by the application of AI:

- Which professions are easier for AI to replace human beings?
- Which professions are most challenging for AI to replace human beings?
- What kind of new jobs might emerge because of AI?
- What are the advantages of such a transformation?
- What are your ideas about an ideal society?
- Do we need universal basic income to compensate for the potential unemployment resulting from AI?
- And what can we do to make sure there is a smooth transformation for the individuals directly affected by this transformation?
- What does such a transformation mean for education in the future, especially for adult education?

6.2 EXAMPLE OF A TRAINING ON AI PERCEPTIONS, ETHICS AND SOCIETAL CHALLENGES

6.2.1 PREPARATION



Time: 8 pedagogical hours and breaks



Learners: Adult learners, who want to address and discuss the topics AI perception, ethics and bias in AI and societal challenges concerning AI



Learning outcomes: After the training, learners will have a reflective perception on the topic of AI and its relevance to ethical issues and societal challenges. Through discussion in particular, learners will engage with the impact of AI on our society and develop a sense of where AI can also lead to challenges.



Methodology: Icebreaker, assessment exercise, discussion, group work, group exercise in pairs, case study, reading, presentation, brainstorming, internet research, reflection, evaluation.



Equipment: Whiteboard (or digital alternative like Jamboard, Padlet, etc.), bigger sheets (or Padlet in an online version), projector, pens, colours, internet access as well as all learning materials printed or digital (specific chapters of the briefings, questions for the world cafe, etc.).



Preparation of the classroom: Classroom should be open, and have tables, chairs, and whiteboard/board/space on the wall. When doing an activity in a virtual environment, choose the appropriate platforms for group work and handout designing (Jamboard, Padlet...)

6.2.2 IMPLEMENTATION

TIME	DESCRIPTION OF EACH ACTIVITY
30 minutes (the time might vary depending on the number of the participants)	ICEBREAKER: "PRESENTATION SUITCASE" <ol style="list-style-type: none"><li data-bbox="423 436 1424 552">1. The trainer prepares a suitcase filled with various items (online: screenshot of the items in the virtual suitcase). The items can be very diverse, the important thing is that there is a reference to the topic of AI.<li data-bbox="423 590 1424 621">2. The trainers ask learners to choose an item that is related for them to AI.<li data-bbox="423 659 1424 774">3. Each learner chooses an item from the case and introduces him/herself briefly: Name, Experience with AI, Expectations of the training, How does the item relate to AI? Why did I choose the item?
15 minutes	ACTIVITY: AI PERCEPTIONS – YOUR POINT OF VIEW <ol style="list-style-type: none"><li data-bbox="423 924 1424 1150">1. Before the activity, the trainer sticks two papers on the floor in the classroom (Padlet in an online version). One paper sticks at the left side of the classroom (Padlet room), the other paper sticks on the right side of the classroom (Padlet room). A line can connect the two papers. The left paper says "AI – an opportunity for improvement", the right paper says "AI – a threat to society".<li data-bbox="423 1188 1424 1262">2. The trainer asks the learners to think about which statement they agree with more and then position themselves on the line there.<li data-bbox="423 1299 1424 1373">3. Each learner shall explain his/her position and present the argument to the others.<li data-bbox="423 1411 1424 1484">4. After the discussion, it is possible to place oneself in a different position on the line.

60 minutes

ACTIVITY: AI PERCEPTIONS – ADVANTAGES AND DISADVANTAGES OF AI

1. The trainer divides the learners randomly into two groups.
2. One group decides to present the advantages of AI, the other group considers disadvantages of AI. At the end, the groups should present the advantages and disadvantages to each other. To support the arguments, each group will have access to two case studies (see below) of what AI can bring. Plus, some clues about advantages and disadvantages will be given without the argumentation behind (see below).
3. In the end both groups discuss together and form a common perception on the question: What can AI bring to our society? Please document your results on a whiteboard (or Jamboard, Padlet, etc.).
4. For additional reading, use worksheet "Additional Reading: AI perceptions"

15 minutes

Break

60 minutes

ACTIVITY: AI PERCEPTIONS – AUTONOMOUS DRIVING AND AUTONOMOUS WEAPONS

1. Please read the chapter 6.1.1.2 case studies / examples to get an idea of how diverse the use of AI already is in our society.
2. Form pairs of 2 learners and discuss the following questions with each other:

Autonomous driving and autonomous vehicles:

- a. What are the advantages of autonomous driving? And what might be the problems?
- b. What is “partial autonomous” and “fully autonomous”? What is your understanding?
- c. When we discuss autonomous driving and autonomous vehicles, who shall take the responsibility?
- d. Who/what is being transported by autonomous vehicles?
- e. What does autonomous driving and autonomous vehicles mean for: ownership of vehicles, driving schools, drivers as an occupation, traffic regulation, and legal regulation, etc.?

Autonomous weapons: are autonomous weapons really autonomous?

- f. What are the advantages of autonomous weapons? And what might be the problems?
- g. What is “partial autonomous” and “fully autonomous” when it comes to weapons?
- h. How to understand the statement from the Pentagon that “humans will always be in control of AI weapons”?
- i. Where are autonomous weapons being used these days?
- j. Who takes the responsibility?
- k. What does this mean for: officials/operators/generals, soldiers and civilians, regulation and international laws, the production and supply of such weapons, and the engineers who program the software?

3. Come back to the large plenary and talk together about your experiences, results, and open questions from the small group work.

15 minutes Break

30 minutes	<p>ACTIVITY: ETHICS AND BIAS IN AI – CASE STUDIES / EXAMPLES</p> <ol style="list-style-type: none"> 1. The trainer presents four examples on ethics and bias in AI to the learners (use 6.1.2.2): <ol style="list-style-type: none"> a. Recruitment programme of Amazon b. Racist healthcare in the US c. Prediction of Crime in the US d. AI as an alternative solution to triage in the battlefield
90 minutes	<p>ACTIVITY: ETHICS AND BIAS IN AI – WHAT IS BIAS? HOW CAN WE PREVENT AI FROM ACTING ON BIAS?</p> <ol style="list-style-type: none"> 1. Collective brainstorming on the concept of bias. What does the word bias mean? Can you provide a sample of bias, for instance a witnessed situation or reported by the newspaper? (Use sticky notes on the Whiteboard or in the Jamboard, Padlet, etc.). 2. Come to a shared definition of bias, write the definition on the Whiteboard or Jamboard, Padlet, etc.. Validate it through internet research. 3. Form 3 small groups. Each group reads one case study. Discuss the following questions within your group: What is in your case study bias? How is the bias in your case study generated? What could have been done to avoid the bias? 4. Based on your comments on your case study, write down 5 useful recommendations for Ethic in AI. You can also use the internet for further research. 5. Present your case and your recommendations to the other groups. 6. Reflect about the impact of Ethics in AI. Consider the question: How can bias be avoided? Right down your ideas on the Whiteboard or in the Jamboard, Padlet, etc. 7. For additional reading, use worksheet “Ethics and bias in AI”
15 minutes	Break
60 minutes	<p>ACTIVITY: SOCIETAL CHALLENGES RELATED TO AI</p>

Generally, we need to address the question of responsibility in the application of AI (AI in driving, in war zones, in triage, etc.) and the question of autonomy.

1. Please conduct your own individual internet research on the questions: What is responsibility? What is autonomy? You can also use the theoretical information in chapter 6.1.3 Societal challenges concerning AI.
2. Build a common definition on the terms “responsibility” and “autonomy” with all learners.
3. Collective brainstorming on the use of AI for addressing societal challenges: what are some urgent societal challenges? Do you have any idea about how AI is used or can be used to tackle them? Write down your ideas on the Whiteboard or in the Jamboard, Padlet, etc.
4. Watch these two videos: [AI in agriculture](#) and [AI in epidemics](#)
5. Collective discussions on the video: how is AI used for addressing societal challenges? What are the pros and cons of its application in the fields?
6. Once you defined how AI is used for tackling societal challenges, check some other examples here: [Applying AI for social goods](#)
7. Reflection: What does AI mean for education in the future? Especially for adult education? Write down individually all your ideas on sticky notes and present them to the group of learners. Collect all your ideas on a moderation wall (in an online version: padlet, etc.). In the next step, group your ideas into categories. Give the categories headings. What are the key words for the application of AI in adult education that you have received as a result?

6.2.3 CONCLUSION AND EVALUATION

Trainer asks learners the following questions:

1. Did this training session meet your expectations?
2. Highlight one thing you would change in this training flow. How?
3. What will you remember most from this training?
4. How will you transfer this knowledge into practice?
5. How has your perception on AI changed? Did your perspective on ethics and bias in AI change? What is your new position regarding societal challenges concerning AI?
6. Think of something meaningful and important that was told in this training. Share.



6.3 RESOURCES ON AI PERCEPTIONS, ETHICS AND SOCIETAL CHALLENGES

6.3.1 RESOURCES FROM THE PROJECT AIAE

- [Briefings](#): pages 4 - 18, 35 - 41
- [Interviews](#): Interview 2: snippets 5 to 7, Interview 3: snippets 5 and 6, Interview 4: snippets 1 to 5 and snippets 7 to 9, Interview 6: snippets 3 to 5
- Learning scenarios in the [toolkit](#): AI and Ethics, AI Perceptions, AI and societal challenges
- Platform: <https://www.studio2b.de/aiae-en/>

6.3.2 MORE ABOUT AI perceptions, ethics and societal challenges

AI PERCEPTION

KEY CONCEPT: TECHNOLOGY

- The Technological View of the World of Martin Heidegger:
<https://www.futurelearn.com/info/courses/philosophy-of-technology/0/steps/26314Youwillhavethechoicetheeitherwatchingthevideoorreadingthearticle>
- an overview of philosophical inquiry on technology:
<https://plato.stanford.edu/entries/technology/>

KEY CONCEPT: AUTONOMY

- An overview of philosophical inquiry on autonomy:
<https://www.oxfordbibliographies.com/view/document/obo-9780195396577/obo-9780195396577-0167.xml>
- Autonomy in Britannica: <https://www.britannica.com/topic/autonomy>
- More information for the definition of autonomy:
<https://plato.stanford.edu/entries/autonomy-moral/>
- What is personal autonomy? <https://plato.stanford.edu/entries/personal-autonomy/>

CASE STUDIES

- <https://blog.google/products/maps/google-maps-101-ai-power-new-features-io-2021/>

AUTONOMOUS DRIVING:

- <https://www.tesla.com/support/autopilot>

- <https://www.carscoops.com/2022/03/tesla-ordered-to-refund-model-3-buyer-after-german-court-hears-it-steers-like-a-drunken-novice-driver/>

AUTONOMOUS WEAPONS:

- <https://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/May-June-2017/Pros-and-Cons-of-Autonomous-Weapons-Systems/>
- And more information on autonomous weapons: <https://autonomousweapons.org/>
- and discussion over the ban on autonomous weapons: <https://www.washingtonpost.com/technology/2021/07/07/ai-weapons-us-military/>
- Autonomous weapons – explained by DW: <https://www.youtube.com/watch?v=NpwHszy7bMk>
- Autonomous Weapons – explained by BBC: <https://www.youtube.com/watch?v=xo4kFivp1i0>
- Autonomous weapons and international law: <https://www.youtube.com/watch?v=-vryhsECno>

ETHICS AND BIAS IN AI

- Ethics: <https://www.britannica.com/topic/ethics-philosophy/Problems-of-divine-origin>
- Bias and implicit bias: <https://plato.stanford.edu/entries/implicit-bias/>

CASE STUDIES

- Technical framework of algorithmic bias: https://en.wikipedia.org/wiki/Algorithmic_bias
- <https://www.logically.ai/articles/5-examples-of-biased-ai>
- Explanation and examples of bias in AI: <https://research.aimultiple.com/ai-bias/>
- Solutions for bias in AI: <https://www.lexalytics.com/lexablog/bias-in-ai-machine-learning>
- BBC video on bias in AI: <https://www.youtube.com/watch?v=b4UyT85H3Hg>
- MIT lecture on AI bias: https://www.youtube.com/watch?v=wmyVODy_WD8
- DARPA and AI in triage:
 - <https://www.washingtonpost.com/technology/2022/03/29/darpa-artificial-intelligence-battlefield-medical-decisions/>
 - <https://www.darpa.mil/news-events/2022-03-03>
 - Event 201 - an exercise of pandemic: <https://www.centerforhealthsecurity.org/our-work/exercises/event201/>

SOCIETAL CHALLENGES CONCERNING AI

KEY CONCEPT: DATA PROTECTION

- EU's regulation on data protection: <https://gdpr.eu/>
- EU regulations over the application of AI: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0206&from=EN>
- EU Data Protection supervisor on AI: https://edps.europa.eu/data-protection/our-work/subjects/intelligence-artificielle_de
- Data privacy: <https://usercentrics.com/knowledge-hub/data-privacy-artificial-intelligence/>

KEY CONCEPT: UNIVERSAL BASIC INCOME

- Universal Basic Income: https://en.wikipedia.org/wiki/Universal_basic_income
- <https://www.skynova.com/blog/what-would-you-do-on-ubi>
- UBI in the time of pandemic: <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2020/09/17/momentum-for-basic-income-builds-as-pandemic-drags-on>
- UBI in the EU: <https://www.dw.com/en/coronavirus-billions-of-people-need-basic-income-says-un-body/a-54294292>
- <https://www.dw.com/en/universal-basic-income-an-option-for-europe/a-55711679>
- More information on Andrew Yang's proposal of UBI: <https://hai.stanford.edu/news/radical-proposal-universal-basic-income-offset-job-losses-due-automation>
- Video: https://www.youtube.com/watch?v=GazVdFMy_6o&feature=youtu.be
- <https://www.youtube.com/watch?v=1U1D7nmcnZ0>

CASE STUDIES

- AI on Facebook platform: <https://ai.facebook.com/blog/how-ai-is-getting-better-at-detecting-hate-speech>
- <https://www.wsj.com/articles/facebook-ai-enforce-rules-engineers-doubtful-artificial-intelligence-11634338184>
- AI and Robotics as a threat or a chance to transform the job market in Germany: <https://voxeu.org/article/rise-robots-german-labour-market>
- the future of labour market in the era of AI: <https://www.bcg.com/de-de/publications/2021/impact-of-new-technologies-on-jobs>
- <https://bigthink.com/the-present/automation-jobs/>

- <https://www.digital-future.berlin/en/research/projects/employment-risks-and-quality-of-work-in-the-digital-transformation/>
- <https://www.cio.com/article/228528/planning-for-ais-transformation-of-21st-century-jobs.html>
- and more research on this topic: <https://www.nature.com/articles/s41599-020-00676-8>
- how AI can deepen social inequality: <https://theconversation.com/artificial-intelligence-can-deepen-social-inequality-here-are-5-ways-to-help-prevent-this-152226>



7 CHAPTER

USEFUL WORKSHEETS AND HANDOUTS

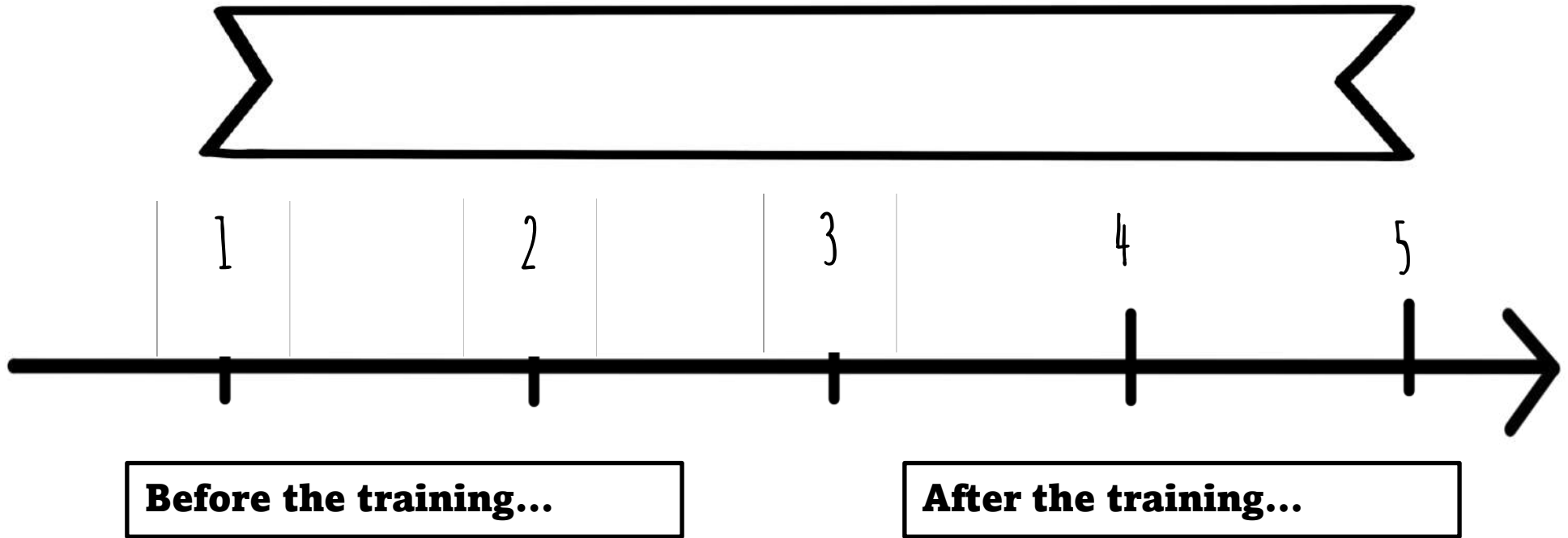
521.8
160.7
229.9954096
1849.918451
585.73854
195.99
200
4310

450
270
58.047
195.99
200

1.2614
0.1621



Worksheet: "Test yourself"



Worksheet: “Learning notes”

What’s new today?

Lessons learnt

AIAE – Learning Notes
Name:
Date:

Worksheet: "Chapter 4: Human machine interaction"

Human machine interaction



example 1

Empty rectangular box for example 1.



example 2

Empty rectangular box for example 2.



example 3

Empty rectangular box for example 3.



example 4

Empty rectangular box for example 4.

What does the future look like?

What patterns/trends do we see looking at our results?

Which trends are most important for me as an individual?

Which trends are most important for the society?

How do I feel about the past, present, and future?

What does this mean for my family? My company? My team/community? Our society?

What do you think of when you hear the word
.....?

solo

pairs

foursomes

Application of AI

image recognition

what I knew

what I learnt

facial recognition

what I knew

what I learnt

voice recognition

what I knew

what I learnt

speech recognition

what I knew

what I learnt

navigation

what I knew

what I learnt

object manipulation

what I knew

what I learnt

AI perceptions – Advantages and disadvantages of AI

Case 1 – Using AI to enrich digital maps

Model tags road features based on satellite images, to improve GPS navigation in places with limited map data.

In training, RoadTagger learns weights — which assign varying degrees of importance to features and node connections — of the CNN and GNN. The CNN extracts features from pixel patterns of tiles and the GNN propagates the learned features along the graph. From randomly selected subgraphs of the road, the system learns to predict the road features at each tile. In doing so, it automatically learns which image features are useful and how to propagate those features along the graph. For instance, if a target tile has unclear lane markings, but its neighbour tile has four lanes with clear lane markings and shares the same road width, then the target tile is likely to also have four lanes. In this case, the model automatically learns that the road width is a useful image feature, so if two adjacent tiles share the same road width, they’re likely to have the same lane count.

Case 2 – The U.S. alarmingly close to an autonomous weapons arms race

We may enter a period of escalation that recalls the nuclear arms race between the U.S. and the former Soviet Union during the Cold War.

“There’s an AI arms race where I’m worried about your development of this technology and you’re worried about my development of this technology, and neither of us communicates that we’re aware of the limitations,” said Chris Meserole, director of research and policy for the

Artificial Intelligence and Emerging Technology Initiative at the Brookings Institution. He spoke during a Defense One/Nextgov panel

discussion on AI ethics and policy.

Worksheet: “Chapter 6: Additional Reading, Ethics and Bias in AI”

Ethics and bias in AI

Case 1 – Amazon

In 2018, Reuters reported that Amazon had been working on an AI recruiting system designed to streamline the recruitment process by reading resumes and selecting the best-qualified candidate.

Unfortunately, the AI seemed to have a serious problem with women, and it emerged that the algorithm had been programmed to replicate existing hiring practices, meaning it also replicated their biases.

The AI picked up on uses of “women’s” such as “women’s chess club captain” and marked the resumes down on the scoring system. Reuters learned that “In effect, Amazon’s system taught itself that male candidates were preferable.” Rather than helping to iron out the biases present in the recruitment process, the algorithm simply automated them. Amazon confirmed that they had scrapped the system, which was developed by a team at their Edinburgh office in 2014. None of the engineers who developed the algorithm wanted to be identified as having worked on it.

Case 2 – Racist healthcare

Last year a team from University of California Berkeley discovered a problem with an AI that was being used to allocate care to 200 million patients in the US, which resulted in black patients receiving a lower standard of care. Across the board, black people were assigned lower risk scores than white people, despite the fact that the black patients were also statistically more likely to have comorbid conditions and thus in fact experience higher levels of risk. This in turn meant that black patients were less likely to be able to access the necessary standard of care, and more likely to experience adverse effects as a result of having been denied the proper care.

The problem stemmed from the fact that the system was allocating risk values using the predicted cost of healthcare as the determining variable, and because black patients were often less able to pay or were perceived as less able to pay for the higher standard of care, the AI essentially learned that they were not entitled to such a standard. Having made this discovery, the UC Berkeley team worked with the company responsible for developing the tool to find variables other than cost through which to assign the expected risk scores, reducing bias by 84%.

Your personal notes:

Case 3 – Compas

COMPAS (which stands for Correctional Offender Management Profiling for Alternative Sanctions) is an algorithm used in state court systems throughout the United States. It is used to predict the likeliness of a criminal reoffending; acting as a guide when criminals are being sentenced. Propublica analysed the COMPAS software and concluded that “it is no better than random, untrained people on the internet“ . Equivant - the company who developed the software - disputes the programme’s bias. However, the statistical results the algorithm generates predict that black defendants pose a higher risk of reoffending than a true representation, while suggesting that white defendants are less likely to reoffend. Black defendants were almost twice as likely to be misclassified with a higher risk of reoffending (45%) in comparison to their white counterparts (23%).

Your personal notes:

Conclusion and Evaluation

- 1. Did this training session meet your expectations?**
- 2. Highlight one thing you would change in this training flow. How?**
- 3. What will you remember most from this training?**
- 4. How will you transfer this knowledge into practice?**
- 5. How has your perspective on this subject changed?**
- 6. Think of something meaningful and important that was addressed in this training. Share.**



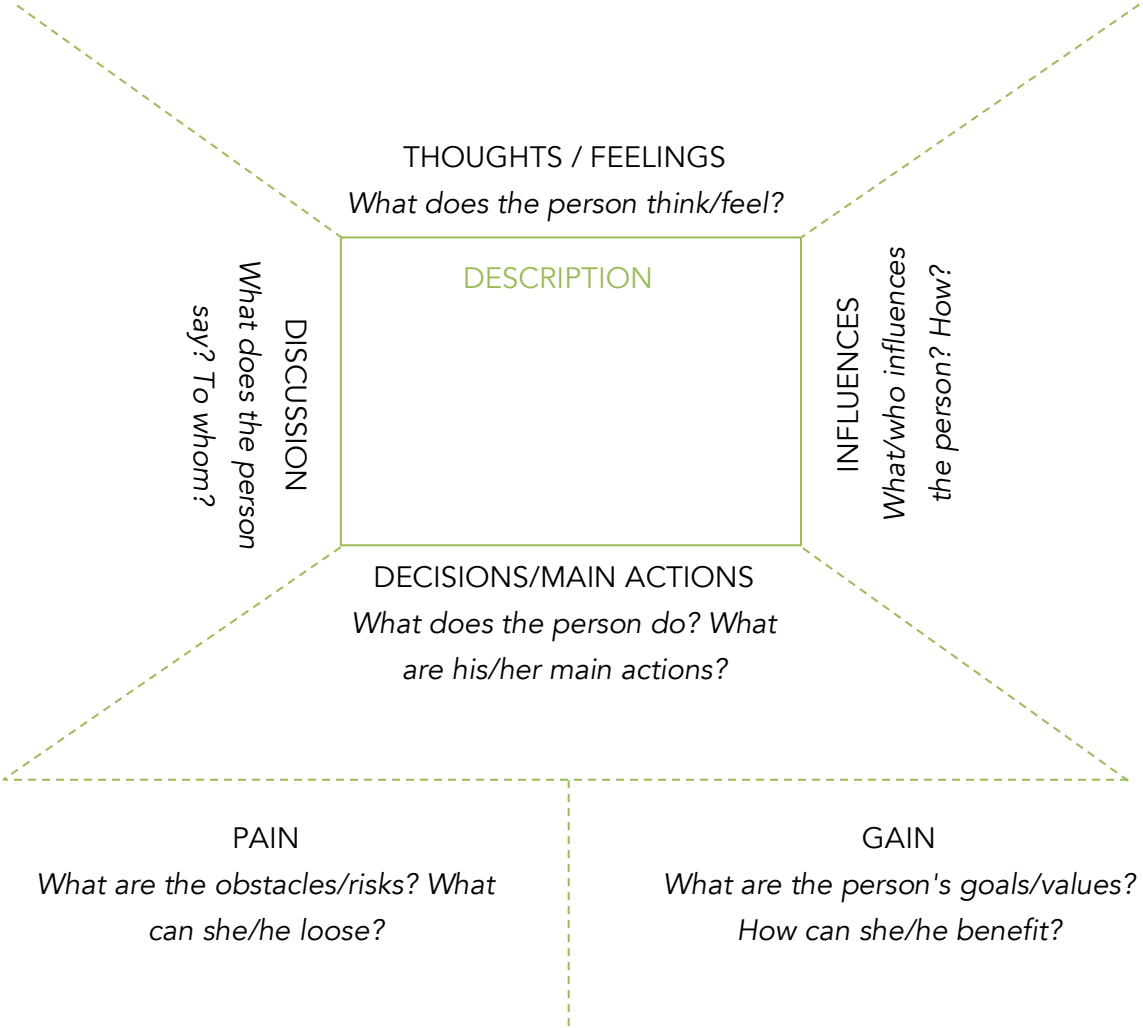
CHAPTER
8

MAKING YOUR OWN TRAINING
ABOUT AI

Reading previous chapters could have inspired you to make your own training about artificial intelligence. Although there are many activities described in this handbook, it is important to adjust training contents and methodology to your resources and target group. For that reason, following tasks will help you create your own training about artificial intelligence, include some of the activities and contents from the handbook and think of innovative ways to conduct your own training on the topic of AI.

8.1.1 TASK: EMPATHY MAP

Make an empathy map of a typical learner that will participate in your training. Draw the portrait of the person in the middle. Decide upon his / her name, demographics, family data etc. Then, answer the questions written on the empathy map. This will help you adjust the contents of your training to the needs of learners, which can result in higher motivation of the learners. What have you learned about a typical learner? How will you acknowledge that in the training?



8.1.2 TASK: TRAINING'S CANVAS

Answer the questions in the table below, which will help you define the general outline of the training. You can use various ideas from this handbook to find appropriate methods, activities, contents, resources, materials and goals.

<p>GOALS: list the key learning goals / how will you know you reached the goals?</p>	<p>CONTENTS: list the key contents you would like to include in the training / which topics are the most relevant for the learners?</p>	<p>KEY MESSAGES & MEANS OF COMMUNICATION: what do you want to tell to learners? / how will you communicate with them?</p>	<p>CHARACTERISTICS OF THE LEARNERS: what are the needs and expectations of learners? Describe the learners (use findings from the empathy map)</p>
<p>CHALLENGES AND OBSTACLES: list perceived risks and obstacles / what could negatively impact the training?</p>	<p>METHODS & ACTIVITIES: define which methods / activities will be used in the training.</p>	<p>TOOLS & MATERIALS: which tools / materials will you use?</p>	
<p>RESOURCES & INVESTMENT: which resources & competencies are needed for the training? / where do you expect significant costs? where will the training take place?</p>	<p>GAINS FOR THE LEARNERS: what will learners gain from the training? / where can they apply the knowledge?</p>		

8.1.3 TASK: TIME MANAGEMENT

The training time frame is crucial because it allows trainees' to achieve maximum productivity. In each of the training examples in Chapters 4, 5 and 6, the time frames of the individual activities are given. But before the training takes place, it is good to get the whole course of training into a visual image. You can help yourself with online timeline design tools that give you a good and attractive overview of the training:

- [Creately](#)
- [Visme](#)

Often, however, we lose touch with time and do not stick to the planned time frame. That's why it's good to time-measure our training. You can easily do this with a phone's stopwatch, or use an easy online tool to help you pre-form your training time blocks and time it out for you. Keep in mind that the alarm must be as little invasive as possible. The audible alarm should be intended only for your insight into the course of training, as it may disrupt trainee's flow.

- [Time Blocks](#)

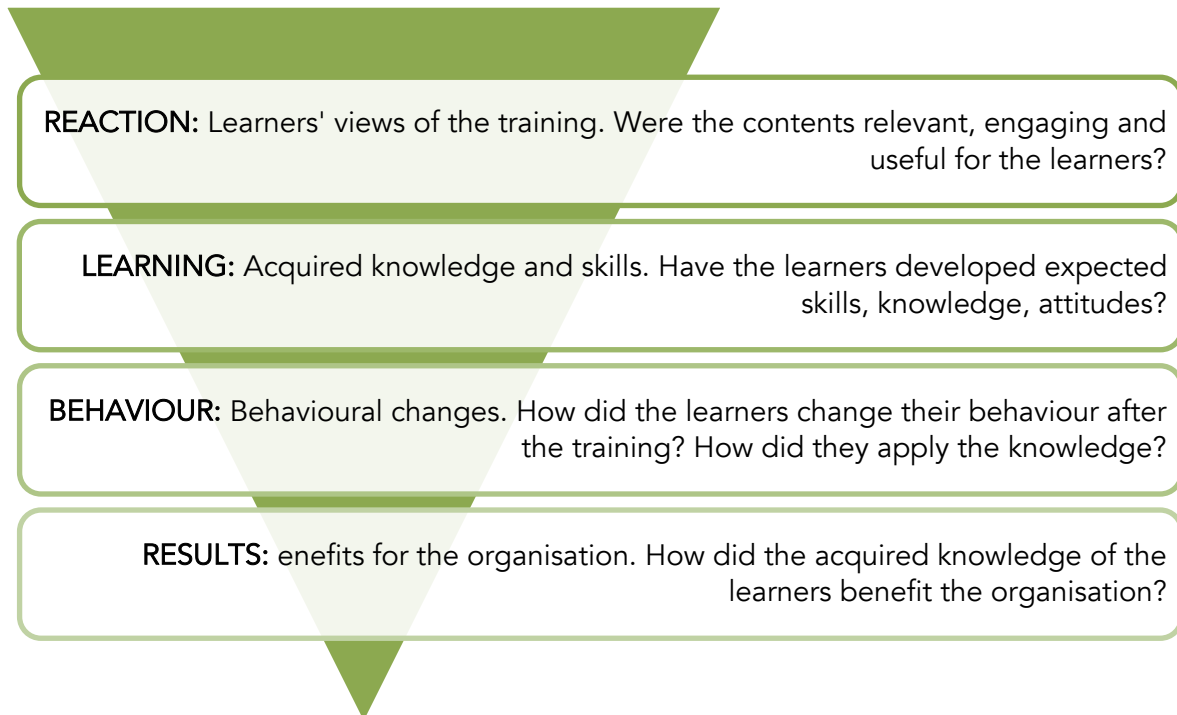
8.1.4 TASK: WHEN THINGS GO WRONG

In the Canvas you have already anticipated what can go wrong during the training. Now, think also about how to prevent this from happening, and possible solutions in case it happens. In this way, you will be better prepared for the challenging situations at the training.

What can go wrong?	Prevention / solution
<i>Learners will not understand basic terms of artificial intelligence.</i>	<i>Aside from providing a definition, I will tell a simple example of basic terms from everyday life. This way things will become less abstract. I will find these examples before the training.</i>

8.1.5 TASK: KIRKPATRICK'S MODEL OF TRAINING EVALUATION

Measuring the effectiveness of the training can be challenging. To focus on various aspects of the training, not just on the impressions of the learners, it is recommended to use Kirkpatrick's model of the training evaluation. It consists of four levels, which are represented in the picture below.



8.1.6 TASK

Below is the customised version of the Johari Window Model which offers a self-assessment of your strengths and weaknesses, which are essential insights into your progress as a trainer. It helps to better understand your dynamic of working as a trainer, but also provides insight into how learners perceive you.

	KNOWN TO SELF	NOT KNOWN TO SELF
KNOWN TO OTHERS	<p>OPEN/ARENA</p> <p>What am I doing right at the training?</p> <p>What learners liked about the training? What is the evidence for this?</p>	<p>BLINDSPOT</p> <p>What were the suggestions for improvement of the learners from my previous trainings?</p> <p>How can I follow them?</p>
NOT KNOWN TO OTHERS	<p>HIDDEN/FAÇADE</p> <p>What's something I don't feel most confident about? What was challenging for me?</p> <p>Is there a way I can develop that?</p>	<p>UNKNOWN</p> <p>What did I learn about myself?</p> <p>Is there a common feature that keeps coming up that I wasn't aware of?</p>

Each quadrant has its own very specific topic to focus on. The open/arena region in quadrant one is all about contributing. Quadrant two is the blind region, and it is all about acknowledgment and feedback. Quadrant three is the hidden region, which is basically about the expression of intent in terms of what you're working on or challenged by. Quadrant four is the unknown, which focuses on the possibility.

SELF-REFLECTION QUESTIONS THAT CAN HELP YOU ON YOUR WAY TO IMPROVE YOUR TRAININGS:

1. *What am I doing right at the training?*
2. *Which activities learners enjoy the most?*
3. *What are the areas I need to work on to become a better trainer?*
4. *What were the suggestions of the learners from my previous trainings? How can I follow them?*



CHAPTER

9
ABOUT THE PROJECT

Artificial Intelligence (AI) is swiftly shaping the discussion about the future of work and society on an international scale. As a result, governments of single countries as well as the European Union (EU) have passed an AI-Strategy. Business leaders have already recognised how fundamentally AI may change the processes of their companies. However, disputes on the topic as well as the proactive shaping of AI have not reached the general public yet. Until now, the seemingly complex phenomenon of AI, including its processes as well as chances and implementation of the technology, seem to be reserved for scientists, specialised experts and employers as well as students and companies that have a relation to the topic. Many other groups are not sufficiently informed. Scepticism or even fear towards the impact of AI on daily lives at home and at work is common. The lack of knowledge about AI's basic functions, its impact as well as opportunities and risks are major challenges, even though AI is already implemented in everyday living and working environments.

The project Erasmus+ „[AI Curriculum for Adult Education](#)“ (AIAE) addresses trainers in adult and professional education and adult learners such as employees and job seekers that have little or no background, nor previous experience in the field of AI. This project enables trainers in adult education to strengthen their own digital skills and acquire knowledge on AI. When conducting the courses, they further function as multipliers and support the participants in developing their digital skills and gaining knowledge on the topic.

Within the project relevant subject areas were identified, appropriate learning goals were developed, a curriculum was designed, teaching materials were created and educational institutions from every partner country were trained on how to use the curriculum accordingly. The AI curriculum is available free of charge and can thus be used by all adult education institutions for further trainings.

The consortium includes the five following partners:



[Stati Generali dell'Innovazione](#) (Italy) is a non-profit, non-political association based in Italy. It was founded in 2011 with the aim of developing a common perspective on innovative guidelines and policies for diverse target groups and actors in politics, civil society and business.



[LT Synergy](#) (Cyprus) is an advisory firm providing holistic governance, risk, compliance (GRC) and organisational effectiveness services, to the local and regional market with the aim to inspire organisations to transform, grow and excel in their market for the benefit of their stakeholders.



[STEP Institute](#) (Slovenia) is a research and training organisation that is developing innovative methods for people's potential. It empowers people for better functioning in the work environment through innovative methods.



[emcra GmbH](#) (Germany) is a leading German training and consulting company within the areas of management and funding. As an accredited educational institution, emcra is an active provider of training programmes in the field of vocational orientation and adult education.



[Studio2B](#) (Germany) is a Berlin-based social enterprise that pursues the goal of making vocational orientation and vocational training more modern, creative and digital by implementing a wide range of innovative concepts for young people and adults within Germany and worldwide such as e-learning courses, virtual company tours, 360° videos and VR trainings.

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