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#NEXT

LEARNING MATERIAL

Authors:

Centrum Wspierania Edukacji i Przedsiebiorczosci (PL)

Asociatia Scout Society (RO)

bit Schulungscenter GmbH (AT)

DEX Innovation Centre (CZ)

Avrasya Enstitüsü Araştırma ve Geliştirme Limited Şirketi (TR)

Fthia in action (GR)

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Unit 1: AI, Definition and Current Trends

Objectives:

- To provide a clear definition of the concept of AI.
- Raise awareness about the relationship between AI and society nowadays.
- To identify the current trends related to AI and familiarize the audience with the presence of AI in different sectors.

The aim of this subchapter is provide a brief description of the field of Artificial Intelligence (AI). The article will present the definition of AI and some current trends in AI.

1.1 Definition

The concept of 'artificial intelligence' was first coined and used in 1955 by McCarthy and at a 1956 workshop in one of the US Ivy League university and described 'science and engineering of making intelligent machines, especially intelligent computer programs' (McCarthy et al., 2006, p.2). However, over the years, AI's definitions took various forms.

According to Britannica, Artificial Intelligence or simply AI is 'the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings' (https://www.britannica.com/technology/artificial-intelligence). According to the New International Webster's Comprehensive Dictionary of the English Language, one of the definitions of AI is 'the concept that machines can be improved to assume some capabilities normally thought to be like human intelligence, such as learning, adapting, self-correction, etc.'. Thus, the stake of Artificial Intelligence is pretty high since it militates for the development of human-like attributes and processes that can be encapsulated by computers. More recent definitions underline that AI imitates intelligent human behaviour. However, the questions that comes into the human mind is what can a machine, such as a computer, perform in order to be defined as intelligent? This comes down to computers programs and AI intelligent systems. According to the article 'Artificial Intelligence: Definition, Trends, Techniques and Cases' (https://www.eolss.net/Sample-Chapters/C15/E6-44.pdf) , artificial intelligent systems fall into four categories:

- Systems that think like humans
- Systems that act like humans
- Systems that think rationally
- Systems that act rationally.

1.2 Current Trends

While AI has been present in the last few years, it is significantly increasing its presence nowadays, registering substantial impact on various layers of our society, from social to economic. More and more industries use AI as a common tool nowadays. Since the world has just made its entry in 2023, we will present some of trends in AI to look closely at during this year and in the long run.

1. Cybersecurity

Cybersecurity is related to information security. Information security comprises the tools and processes that an organization uses in order to secure and protect its information, as well as

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for surveillance. Since more and more companies, organizations, institutions move their work online or partially online, one of the AI trends that society is witnessing today is the significant use of AI technology for cybersecurity. With a substantial influence on network and infrastructure security, AI can be used for 'preventing unauthorized access, use, disclosure, disruption, modification, inspection, recording, or destruction of information' (https://www.analyticsinsight.net/top-10-artificial-intelligence-trends-to-lookout-for-in-2023/). AI can be used to improve security measures, such as:

- Voice and face recognition
- Video analysis
- Biometric authentication (https://www.computer.org/publications/tech-news/trends/the-latest-artificial-intelligence-trends-to-embrace).

2. Communication

The current trend of AI in communication is based on the Natural Language Processing tool, which 'generate visual, auditory and text-based automatically' (https://www.computer.org/publications/tech-news/trends/the-latest-artificial-intelligence-trends-to-embrace). The AI chatbots classifies as one of the NLP trends. Chatbots are 'online computer programs that use cloud-based services and AI techniques to hold simulated conversations with people. The human user types or speaks a question, and the chatbot responds, providing information or undertaking a simple task' (https://unesdoc.unesco.org/ark:/48223/pf0000376709). AI tools, such as Chatbots, replace the following human activities:

- Answer customers' simple and repetitive questions
- Organize appointments
- Send reminders
- Set deadlines.

All in all, the automated process that AI facilitates increase efficiency, remove manual errors, facilitate business-customer interactions, ease the work of customer support teams and facilitate business processes.

Other trends in communication are Large Language Models, which include Statistical Language Models, Neural Language Models, Speech Recognition, Machine Translation, Sentiment Analysis, and Text Suggestions.

3. Autonomous Systems

According to Analytics Insight, one of the trends in AI is the generation of better autonomous systems. Some of the registered progresses are: drone research, autonomous inspiration and bio-inspired systems. One example can be a self-driven ambulance. The goal of autonomous systems is to think and react independently.

4. Healthcare

Artificial Intelligence can facilitate patients' access to better medical care. It supports the health sector in obtaining faster diagnoses and manages patients' records and hospital admissions. What can be more surprising is that AI can have immense benefits for mental health since, according to VeryWellMind, it may detect behavioural signs of anxiety with over 90% accuracy (https://www.verywellmind.com/artificial-intelligence-could-be-the-future-of-mental-illness-detection-5213212).

5. Art through NFTs

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According to Investopedia, NFTs are Non-Fungible Tokens, representing 'cryptographic assets on a blockchain with unique identification codes and metadata that distinguish them from each other (https://www.investopedia.com/non-fungible-tokens-nft-5115211). NFT has a great influence on artists and their art. NFT impacts the way they are paid and how they work and own their art. According to XP Network Blog, 'most popular NFT collections (BAYC, DeGods, Azuki etc.) are ultimately generated by an AI – in the sense that it's an algorithm that takes dozens of pre-designed features and combines them into thousands of unique characters' (https://blog.xp.network/ai-and-nft-all-you-need-to-know-about-the-latest-trend-ebc3784d59fa). In 2023, art continues to be redefined by art.

6. Digital Avatars

According to Analytics Insight, a digital avatar is 'one of the current and potentially artificial intelligence trends as a visual form or an image that is constructed to represent a person in the virtual world'. Thus, avatars take the form of an image that represents a person in the virtual world. According to Entrepreneur.com, industries, such as businesses, 'can benefit by using digital avatars as part of their brand identity' (https://www.entrepreneur.com/science-technology/digital-avatars-are-the-face-of-the-future-heres-why/434407). For example, Nike, the fashion brand, used AI Digital Avatars as marketing tools and created Nikeland.

7. Ethics

Since AI is designed to imitate intelligent human behaviour, there are plenty of discussions, debates and concerns regarding the ethics of AI and how it can be used in the most ethical way. According to Analytics Insight, AI ethics constitute 'a system of moral principles and techniques intended to develop AI's responsible use. Its core components include avoiding AI bias, AI and privacy, avoiding AI mistakes, and managing environmental impact.

8. Military weapons

Artificial intelligence is also employed in almost all military sectors regarding the creation and use of weapons. According to Dataconomy.com (https://dataconomy.com/2022/08/how-is-artificial-intelligence-used-in-the-military/), different from conventional military systems, 'AI-powered military systems can better manage the enormous volume of data efficiently.' AI is used in:

- Military operations;
- Training;
- Strategic decision-making;
- Threat sensing;
- Security.

9. Sustainability

It is a current trend that all companies aim to reduce their carbon footprint and minimize the negative environmental impact. AI can support sustainability in different ways: to identify deforestation and illegal logging and fishing using a computer vision in conjunction with satellite imagery.

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1.3 The role of AI in digital transformation and adaptation

Objectives:

- To define digital transformation and adaptation.
- To explore the role that AI has in the digital transformation and adaptation of the modern society.
- To explore how AI can improve society by accelerating digital transformation and adaptation.
- To provide knowledge assistance to the target group with regard to the role of AI in digital transformation and adaptation.

According to the Enterprisers Project, digital transformation represents 'the integration of digital technology into all areas of a business, fundamentally changing how you operate and deliver value to customers. It's also a cultural change that requires organizations to continually challenge the status quo, experiment, and get comfortable with failure' (https://enterprisersproject.com/what-is-digital-transformation). In modern society, it is impossible not to experience digital transformation. When a company is undergoing the process of digital transformation, that company makes use of digital technologies to improve its work environment and gains. All in all, digital transformation aims to improve the productivity, effectiveness and efficiency of one's business. The improvements may stem from 'new cloud software, such as ERP systems, CRM software, and financial tools, to technology advancements, such as blockchain, robotics, the internet of things (IoT) and artificial intelligence (AI).

As we live in the digital era nowadays, artificial intelligence is liked to and powers digital transformation and adaptation, generating opportunities and improvements in all sectors. For example, giants such as Google, Microsoft, Facebook and Amazon invest 100 billion dollars in developing AI solutions (https://www.digite.com/blog/digital-transformation-and-artificial-intelligence/).

So, the first questions that come into our mind are: 'What does digital transformation entail when AI powers it? What are the implications?' It can be said that AI brings businesses and the entire world to a whole different level of innovation and transformation, being a real source of improvements, opportunities and benefits. Thus, digital transformation powered by AI has the following benefits:

- Reduces human error
- Makes work more efficient and productive
- Reduce human capital
- Preserve the energy of highly professional and qualified employees by taking away from them the burden of carrying out repetitive tasks and maintaining their productivity and motivation.
- Create autonomous systems and automate processes.

Below is a figure released by Harvard Business Review that shows how companies worldwide are using AI. You can conclude that by using AI in all these areas, these businesses are undoubtedly digitally transformed.

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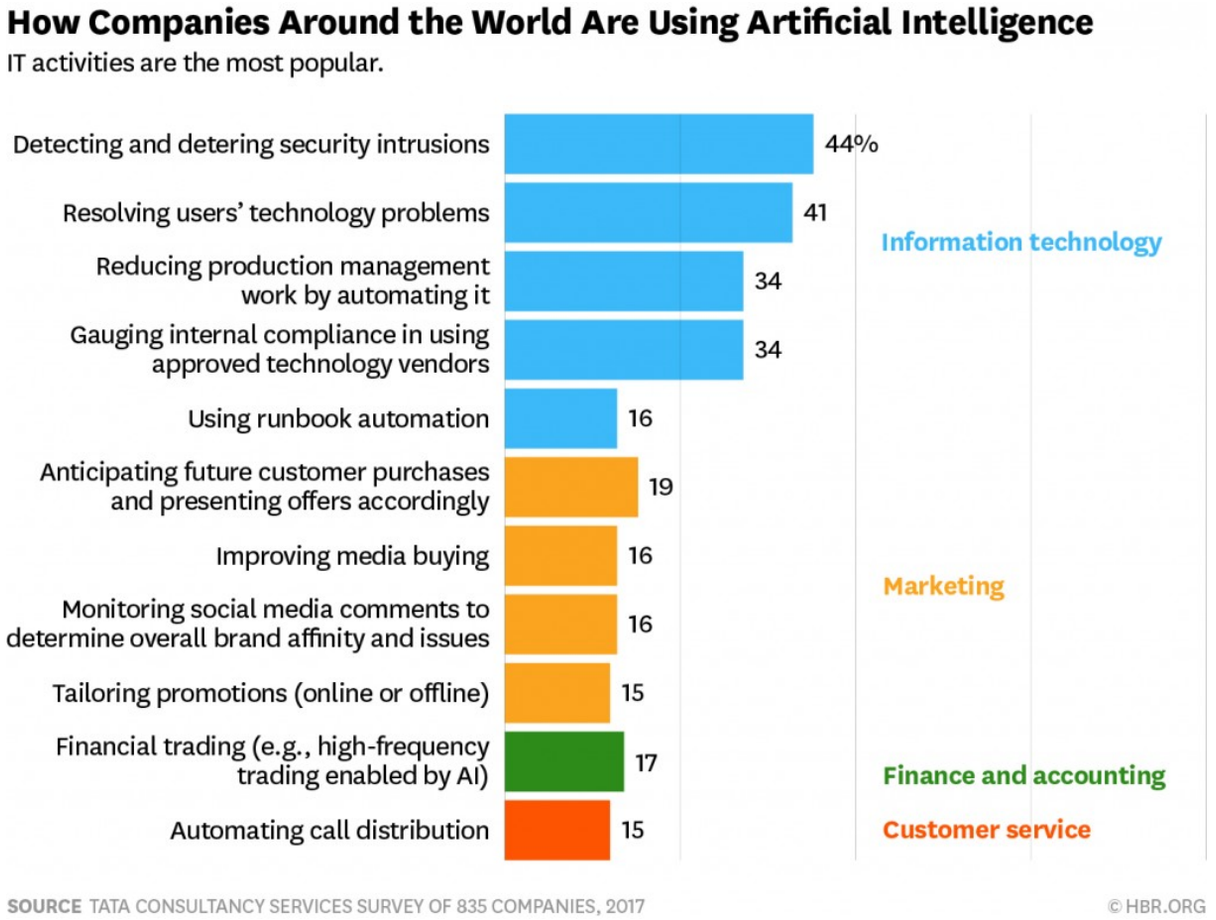

What is essential to know for present and future generations is that, as Satya Ramaswamy states in a Harvard Business Review article, 'automation and artificial intelligence will eliminate some jobs. Chatbots for customer service have proliferated; robots on the factory floor are real. But we believe companies would be wise to use AI first where their computers already interact. There's plenty of low-hanging fruit to keep them busy for years (https://hbr.org/2017/04/how-companies-are-already-using-ai).

Moving on, digital transformation goes hand in hand with digital adaptation because once a business is digitally transformed, the need for new approaches and adaptations appear. Thus, the definition of the latter is required. According to Rural Sourcing, digital adaptation constitutes the 'ability to predict, or perceive, quickly evolving business needs, and adjust through new combinations of technology, process and workforce management' (https://www.ruralsourcing.com/wp-content/uploads/2017/09/Intro-to-Digital-Adaptation-WP-Final.pdf).

According to 'An Introduction to Digital Adaptation', digital adaptation can be divided into four main categories:

1. **Evolving needs**

Since the world finds itself in constant change, the needs of human beings are also changing constantly. Thus, companies must adapt their businesses to the evolving needs of their customers, and employees and develop systems that meet and address these needs.

2. **Workforce Change**

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Since businesses undergo digital transformation, it is for sure that the workforce and work culture will change. This fact constrains companies indirectly and directly to change their approach and bring in more technological and IT skills.

3. The experience

In order to improve the services that the companies offer their customers, they start using more technological and digitally innovative tools. All these tools contribute to improving the experience that the customers have in relation to the company.

4. Competitive threat

Digital adaption is critical in companies in order to face a competitive threat rising every day, since 'Companies spring up overnight threatening the core of established organizations' (https://www.ruralsourcing.com/wp-content/uploads/2017/09/Intro-to-Digital-Adaptation-WP-Final.pdf).

According to WhatFix, '50% of businesses recently reported they adopted AI in at least one business function, and 75% of respondents told IDC they plan to digitally transform their operations by 2025' (https://whatfix.com/blog/artificial-intelligence-and-digital-transformation/). As a result, the following areas have been and will be digitally adapted, thanks to artificial intelligence:

1. Customer Service

Artificial Intelligence improves customers' experience by providing intelligent case classification tools, such as 'Einstein Classification Apps', AI-recommendation engines, Chatbots. Companies employ AI in order to analyse customers' attitudes and improve their services.

2. IT and Security

Artificial Intelligence improves companies' security by helping them detect and address potential threats. According to WhatFix, the security technologies powered by AI help businesses:

- Scan systems to identify any abnormalities;
- Spot compromised systems;
- Alert IT specialists regarding threats.

How do AI-powered systems protect businesses from security threats? Through features such as:

- Biometrics, such as facial recognition and fingerprint scanners;
- Double-factor authentication;
- Generating, saving and automating complex passwords for computer protection;
- Prefiguring access control that allows authorized access to the system (https://whatfix.com/blog/artificial-intelligence-and-digital-transformation/).

As WhatFix declares, according to Capgemini Research Institute, 69% of organizations agreed that AI innovations helped them withstand cyberattacks. At the same time, three out of four executives added that AI prompted them to respond faster to data breaches.

3. Sales

By helping companies predict customers' attitudes and behaviour, companies use the data in order to achieve their quotas, better deals and performance. AI is employed in Sales to:

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- Fix prices
- Monitor phone calls to train agents
- Cross-sell or upsell
- Predict potential prospects
- Get the right ads and calculate when to call new leads or send sales emails (https://whatfix.com/blog/artificial-intelligence-and-digital-transformation/).

4. Business Operations

According to WhatFix, business operations can be organized into five general segments:

- Collating, storing and managing data
- Automating workloads
- Preventing outages
- Predicting business performance
- Analysing data (https://whatfix.com/blog/artificial-intelligence-and-digital-transformation/).

5. HR

Some of the examples of Al-powered digital transformation advancements in HR are:

- Improving job adverts;
- Matching job seekers to roles;
- Helping managers automate vital statistics (https://whatfix.com/blog/artificial-intelligence-and-digital-transformation/).

Nowadays, candidates for jobs use intelligent forms to work on their applications, and recruiters use Al tools to schedule interviews and carry out interviews worldwide.

A Garnter (2019) survey emphasized that HR leaders saved costs, enhanced decision-making and improved the candidates' and employees' experience, all by using Al (https://www.gartner.com/en/newsroom/press-releases/2019-01-21-gartner-survey-shows-37-percent-of-organizations-have).

Overall, nowadays, companies can no longer escape the digital transformation process and must adapt at a faster pace. Artificial intelligence is present and will be present for the future years to come and will continue to transform the work of our society, being a strategic factor at the heart of digital transformation and adaptation.

1.4 Al, digital education and social innovation

Objectives:

- To explore the areas of life that can benefit from Al's influence and be innovated.
- To analyse how to apply Al in order to generate Social Innovation.
- To understand how society can use artificial intelligence for social impact.
- Moving on from the business sector, it is high time we discussed Al's implications in the educational and social sectors. The two sectors, similar to the others, cannot escape digitalization and the rapid development of Al and have to find a way to adapt. The first mentions of Al in the educational context trace back to 1970 when researchers started investigating how computers can replace one-to-one tutoring.

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Later on, AI started to be implemented in classrooms in various forms: student-facing AI (learning and assessment), teacher-facing AI (teaching) and system-facing AI (management of educational institutions).

According to UNESCO, AI has the potential to 'address some of the biggest challenges in education today, innovate teaching and learning practices, and accelerate progress towards SDG 4' (https://www.unesco.org/en/education/digital/artificial-intelligence). Artificial intelligence technologies are expected to support the UN Member States achieving the Education 2030 agenda. The 2030 Agenda for Sustainable Goals confirm that digital technologies play a significant role in accelerating progress in education, facilitating inclusive and equitable educational environments and empowering the future of learning. In order to build a shared understanding among the stakeholders about the implications that AI has in education, the opportunities and challenges generated by AI, as well as the competencies needed in order to adapt and fit in a society where AI becomes a standard tool, UNESCO released the publication 'Artificial Intelligence and Education: Guidance for Policy-makers' (https://unesdoc.unesco.org/ark:/48223/pf0000376709). By 2024, it is expected that AI in education will be worth 6$ billion.

How is AI used in education, and how it enhances education?

From elementary to higher education, institutions employ AI-powered systems in order to help the beneficiaries experience learning and teaching under better conditions.

AI tools in education started to be exponentially used during the COVID-19 pandemic when schools closed and were forced to transfer teaching and learn at home. Students, teachers, and school managers found themselves rapidly adapting to the changes and the digital environment.

- Use of educational data to track and support learners in crisis and emergencies
- Machine translation and image recognition technologies to support access to global learning resources
- Personalized, AI-aided mentoring based on individual learning pattern recognition
- Diagnostic technologies for learning difficulties
- Sustainability: AI reduces paper use since educational materials can be used online. Thus, it is expected that if AI is used unanimously, learning will be paperless.
- Autonomous conversational agents: these agents substitute one-to-one tutoring, easing the work of teachers because the conversational agents can answer students' questions and provide assistance and additional materials.
- Adaptive systems: these support students in learning at their own pace and through their own style.
- Use of voice assistants: they can guide students regarding campus needs, schedules and courses.
- Deal with repetitive logistics and administrative stuff (course management, enrolment, access to resources for parents) that steal from teachers' time. Instead, with AI autonomous systems, teachers can invest that time into effective teaching methods.

How to ensure the ethical, inclusive use of AI in education:

According to UNICEF, inclusive education is 'a dynamic process that is constantly evolving according to the local culture and context, […] to celebrate diversity, promote participation and overcome barriers to learning and participation of all people.' The digital innovation that AI generates in education reduces barriers when it comes to learning. This is because AI systems can be tailored and personalized to each student's needs. According to Forbes, AI systems in education are 'being used to develop a custom learning profile of each student

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and customize the training materials for each student based on their ability, preferred mode of learning and experience' (https://www.forbes.com/sites/cognitiveworld/2019/07/12/ai-applications-in-education/?sh=4abe456262a3). As a result, AI systems in education dispose of high potential to accommodate differences between people in education, can assist every person's needs by catering the materials offered and help society achieve the SDG 4 to 'ensure inclusive and equitable quality education and promote lifelong learning opportunities for all'. However, in order to avoid disparities regarding access to digital technology, policymakers across the words should make sure that AI-powered systems and approaches in education are available to everyone irrespective of their socio-economic status, gender, disability, ethnicity, culture, or location.

What is very encouraging and already registers positive outcomes is that AI tools already advance inclusion in education: The Global Digital Library using Google Voice Assistant, Detective, speech recognition and transcription tools, intelligent robots, telepresence robots, and tutoring systems (ITS).

Benefits and risks of AI technologies in education:

Benefits:

From the start, AI is used to facilitate the management and delivery of education. Educational management is facilitated because many processes are automated: school administration, attendance, timetabling, enrolment, admissions and grades. Such facts make school systems and institutions more effective, productive and cost-reduced. Moreover, it improves the experience and energy of the staff. AI tools are also used to analyse students' mental health, detect unhealthy behaviours, and assess and monitor how much attention students pay in class.

In addition to management and delivery, AI proves effective also when it comes to learning and assessment. According to UNESCO, with regard to language and assessment, AI makes its presence felt with the so-called 'intelligent tutoring systems' (ITS). The systems have been predominantly used, and many investments have been made. The system provides individualized tutorials for each student, depending on the topic. The system traces the students' behaviour and pace and automatically adjusts the rhythm according to the observations, facilitating students' work to achieve their learning goals. Such a system is beneficial for the student's learning. On the other hand, there are the 'dialogue-based tutoring systems' (DBTS) that use 'NLP' (natural language processing) to ensure a tutorial dialogue between tutors and students in order to go through online tasks. The system is made, so students discover the solution, receiving guidance only. Some other AI tools are those that support reading and language learning, intelligent robots, teachable agents etc.

To move on, AI proves to have real benefits for teachers and teaching generally. AI-powered systems reduce teachers' time in carrying out an assessment and administrative tasks. This way, teachers can invest the time they otherwise use in the aforementioned tasks in providing more attention to students. As the UNESCO article reports, 'AI tool's role would be to make the teachers' job easier and more collegiate. An example is the 'LeWaijiao AI classroom', which is designed to support human teachers so that they may conduct all of the key tasks' (AI and education: guidance for policy-makers - UNESCO Digital Library).

Challenges:

As AI in education presents enormous benefits, it also comes with a series of challenges that must be addressed.

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First of all, one of the challenges is related to location and accessibility. People in countries either have access to technology or need access. Students and educational systems from rural areas can be left behind in the fast-pacing process of adapting to an AI-powered environment. As a result, AI may unconsciously contribute to deepening the equitable gaps between students. Accordingly, there is a severe need to bridge the gap between countries where the implementation of AI is either more advanced or less advanced. At the same time, there is a need to work on low-cost models to develop AI tools that everyone can access. For this, the needs and interests of all countries shall be listened to.

While AI offers great comfort and replaces many human tasks, it also distances students from teachers and teachers from teachers. Thus, AI-powered systems have to find a way to connect students and teachers remotely. Some intelligent systems reduce human contact and questioning; thus, the impact these have on the teachers' role and the relationship between students and teachers. As UNESCO article declares, 'while this might have some benefits in contexts where teachers are scarce, the aim of eliminating the need for human teachers reveals a fundamental misunderstanding of their essential social role in the learning process' (AI and education: guidance for policy-makers - UNESCO Digital Library). In order to avoid dehumanization, AI in education must be balanced.

Thirdly, the concern that arise when it comes to AI-powered systems used in education in order to handle data – dataveillance, as it is called by Lupton and Williamson, 2017 – are linked to confidentiality, data ownership, privacy and consent and how data is being used. As underlined in the UNESCO report, with reference to Hao, 2019, companies are increasingly accused of 'ethics washing', which represents an attempt to escape national or international regulation (AI and education: guidance for policy-makers - UNESCO Digital Library).

Since even systems, just like humans, can make errors when monitoring students' behaviours, AI systems accommodate students' different learning capabilities and avoid biases. As Forbes points out, 'some are more adept at "left brain" thinking with skills for analytical thought, while others are more skilled at "right brain" thinking with creative, literary, and communicative ability' (https://www.forbes.com/sites/cognitiveworld/2019/07/12/ai-applications-in-education/?sh=154a17cb62a3).

AI and Social Innovation in Education

According to Waterford, social innovation is 'the process of improving civilization with the latest scientific research. Its goal can be anything from supporting underprivileged communities to protecting the environment or anything in between (https://www.waterford.org/education/the-impact-of-social-innovation-in-education/). Since artificial intelligence brings innovation in all implementation sectors, it is essential not to ignore that it brings social innovation and progress in education. Advancements in AI and AI's digital transformation bring about social change in the sense that it addresses the needs of the targeted groups – in education, students and teachers. Innovative AI-powered tools in education created an environment orientated to improvement and scientific progress.

AI systems in education address some of the concerns and needs of parents, students and teachers. For example, some parents cannot afford transportation or find it difficult to reach the students' classrooms in order to check the evolution of the students. AI solves this social issue because it facilitates remote communication between teachers and parents. On the students' side, AI tools facilitate students' engagement and learning. AI offers personalized, tailored and individualized systems and tools that schools can employ in order to ensure that each student learns at their pace and achieve their learning outcomes.

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In conclusion, the potential of Artificial Intelligence to bring innovations and contributions to digital transformation, adaptation, education and social innovation is enormous. It is essential not to leave anyone behind because AI-powered systems in any sector can bring unique opportunities that advance society's progress.

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Unit 2: Engagement in AI

2.1 Introduction

This unit aims to provide an in-depth exploration of the topic of engagement with artificial intelligence (AI), one of the most transformative and revolutionary technologies of our time. The technical architecture of an AI system lies at the heart of its functionality. Understanding the fundamentals of data collection, pre-processing, model training and implementation is essential to successfully harnessing the potential of artificial intelligence. By understanding these technical complexities, individuals and organisations can make informed decisions when integrating AI into their operations. In this unit, we will delve into the different types of artificial intelligence systems, learning about their advantages and disadvantages and where they can be used in practice. In addition, we will explore the range of AI tools and platforms available to companies and individuals, enabling them to develop AI solutions tailored to their unique needs. These resources democratise AI and enable users with limited expertise to engage with this cutting-edge technology. We will also examine the impact of artificial intelligence on privacy, employment, biases and decision-making processes. Understanding these implications will help stakeholders deal with the challenges and create AI systems that comply with ethical and regulatory standards This unit aims to equip learners with a comprehensive understanding of AI engagement, enabling them to responsibly embrace its transformative power and make informed decisions in a world increasingly shaped by AI.

Objectives:

- To familiarise learners with the general concept of artificial intelligence and its subfields
- To provide an understanding of the technical architecture of the artificial intelligence system
- To demonstrate what the workflow should look like when preparing an artificial intelligence system
- To familiarise learners with types of artificial intelligence systems
- To provide an overview of the advantages and disadvantages of these systems and their possible applications
- To expose learners to examples of artificial intelligence tools and platforms
- To present an example of the use of one of the artificial intelligence tools
- To familiarise learners with the social, ethical and privacy implications of implementing artificial intelligence

2.2 The concept of Artificial Intelligence

What is artificial intelligence in general

Artificial Intelligence (AI) has emerged as a groundbreaking technology that is revolutionizing numerous industries and transforming our daily lives. This comprehensive article aims to provide an in-depth exploration of the basic concepts and principles underlying artificial intelligence and its subfields, including machine learning, computer vision, natural language processing, robotics, and more.

Logically, currently available AI systems can be divided into several logical units or areas.

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Artificial Intelligence refers to the simulation of human intelligence in machines to perform tasks that typically require human cognitive abilities. AI systems aim to replicate human thought processes, such as learning, reasoning, problem-solving, and perception. These systems rely on algorithms, data, and computational power to make informed decisions and provide intelligent solutions across various domains.

Subfields of artificial intelligence

Machine Learning (ML) is a subset of AI that focuses on enabling machines to learn and improve from experience without being explicitly programmed. ML algorithms allow systems to automatically analyse and interpret complex patterns in large datasets, facilitating accurate predictions or informed decision-making. The primary types of ML approaches include supervised learning, unsupervised learning, and reinforcement learning.

Deep Learning (DL) is a subset of ML that employs artificial neural networks inspired by the structure and function of the human brain. These neural networks consist of interconnected layers of nodes (neurons) that process and transform input data. Deep Learning algorithms excel at recognizing patterns, extracting features, and making complex decisions. They have achieved significant breakthroughs in domains such as image and speech recognition.

Computer Vision (CV) is a field of AI that focuses on enabling computers to understand and interpret visual information from images or videos. CV algorithms aim to replicate human visual perception by analysing digital images or video frames, extracting meaningful information, and recognizing objects, faces, text, and other visual elements. Applications of CV range from self-driving cars and surveillance systems to medical imaging and augmented reality.

Natural Language Processing (NLP) is a field of AI concerned with the interaction between computers and human language. NLP algorithms enable machines to understand, interpret, and generate human language in a meaningful way. This subfield encompasses tasks such as sentiment analysis, language translation, speech recognition, and chatbots. NLP techniques enable machines to comprehend and generate text, facilitating more natural and efficient human-machine communication.

Robotics combines AI, machine learning, computer vision, and other technologies to design and develop intelligent machines capable of interacting with the physical world. Robots are equipped with sensors, actuators, and AI algorithms to perceive and understand their environment, make decisions, and perform physical tasks autonomously or in collaboration with humans. Robotics finds applications in manufacturing, healthcare, agriculture, space exploration, and more.

Technical architecture of an AI system

AI systems are constructed using a combination of hardware and software components. The technical architecture of an AI system typically involves the following elements:

1. Hardware:

a. Central Processing Units (CPUs): CPUs are the primary processors in AI systems and handle general-purpose computations. They are responsible for executing the instructions of the software and managing system resources. CPUs are well-suited for tasks that require

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sequential processing and are commonly used for data preprocessing, model training, and inference.

b. Graphics Processing Units (GPUs): GPUs are highly parallel processors designed to accelerate computations for graphics rendering. However, their architecture is also well-suited for AI workloads due to their ability to process multiple data elements simultaneously. GPUs are particularly effective in training deep neural networks, which involve computationally intensive matrix operations.

c. Tensor Processing Units (TPUs): TPUs are specialized AI chips developed by Google specifically for accelerating machine learning workloads. TPUs are designed to perform matrix calculations efficiently, making them highly optimized for deep learning tasks. They offer superior performance and energy efficiency for training and inference tasks, particularly when used with frameworks like TensorFlow.

d. Field-Programmable Gate Arrays (FPGAs): FPGAs are hardware devices that can be reprogrammed to perform specific computations efficiently. They are flexible and can be customized for specific AI algorithms and applications. FPGAs are often used in scenarios that require low-latency and high-throughput processing, such as real-time image or video analysis.

e. Application-Specific Integrated Circuits (ASICs): ASICs are specialized chips built specifically for AI tasks. They are designed to deliver high performance and energy efficiency for specific AI workloads. ASICs can be tailored to optimize the execution of particular algorithms, making them well-suited for applications like deep learning.

2. Software Frameworks and Libraries:

AI systems rely on software frameworks and libraries to build, train, and deploy machine learning models. These frameworks provide the necessary tools and APIs for implementing various AI algorithms, handling data, and optimizing model performance.

Typical system would include the following logical components:

a. Software Frameworks: AI systems are built using software frameworks that provide libraries, tools, and APIs for developing, training, and deploying machine learning models. Frameworks like TensorFlow, PyTorch, and Keras offer a wide range of functionalities for building neural networks, handling data, and optimizing model performance. These frameworks provide high-level abstractions and optimizations that simplify the development process.

b. Development Environments: Integrated Development Environments (IDEs) such as PyCharm, Jupyter Notebook, and Visual Studio Code are commonly used for coding and experimentation in AI system development. They provide features like code editing, debugging, and visualization tools, enhancing the productivity of AI developers.

c. Programming Languages: Python is widely used in AI development due to its simplicity, extensive libraries, and support for scientific computing. Python frameworks like NumPy, Pandas, and SciPy provide powerful tools for data manipulation and analysis. Other languages like C++ and Java are used for performance-critical components or when integrating AI systems into existing software ecosystems.

d. Distributed Computing: AI systems often leverage distributed computing frameworks to train models efficiently on large-scale datasets. Frameworks like Apache Spark and TensorFlow's distributed mode allow for parallel processing across multiple machines or

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clusters. This enables the training process to be distributed, speeding up computation and accommodating larger datasets.

e. Deployment and Serving: To deploy AI models into production, systems rely on specialized frameworks and platforms. These include TensorFlow Serving, TensorFlow Extended (TFX), and frameworks like Docker and Kubernetes. These tools help manage and scale AI deployments, handle model versioning, monitor performance, and facilitate efficient model serving in production environments.

f. Cloud Platforms: Cloud platforms such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud offer infrastructure and services specifically tailored for AI. These platforms provide scalable computing resources, prebuilt AI services (e.g., image recognition, language translation), and tools for managing, monitoring, and deploying AI applications. They also offer specialized hardware instances, like GPU or TPU instances, to accelerate processing.

Workflow during the preparation of the artificial intelligence system

When preparing an AI system, the standard workflow could be as follows:

1. Problem Definition:

The first step is to define the problem or task that the AI system aims to solve. This involves understanding the business or application requirements, identifying the data available, and defining the objectives and success metrics.

2. Data Acquisition:

Once the problem is defined, the next step is to acquire the necessary data. This can involve collecting data from various sources, such as databases, APIs, or external datasets. Data acquisition may also involve data pre-processing tasks like cleaning, formatting, and ensuring data quality.

3. Data Exploration and Analysis:

In this step, the acquired data is explored and analysed to gain insights into its characteristics. Exploratory data analysis techniques are applied to understand the data's distribution, relationships between variables, and identify any anomalies or patterns. This analysis helps in determining the most appropriate approaches and models for the task.

4. Data Preparation:

Data preparation involves transforming the raw data into a format suitable for training and evaluation. This step includes tasks such as feature selection, feature engineering, data normalization, and handling missing or inconsistent values. The goal is to ensure that the data is in a suitable format to feed into the AI algorithms.

5. Model Selection and Architecture Design:

Based on the problem definition and the characteristics of the data, a suitable AI model is selected. This may involve choosing from various machine learning algorithms or deciding on a specific deep learning architecture, depending on the complexity of the problem and the available data. The model's architecture and hyperparameters are designed or chosen based on best practices and domain expertise.

6. Model Training:

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The selected AI model is trained using the prepared data. This involves feeding the training data into the model, which adjusts its internal parameters iteratively to minimize errors and improve performance. The training process typically involves techniques like gradient descent and backpropagation. The model is evaluated on validation data to monitor its performance and ensure it is not overfitting.

7. Model Evaluation and Fine-Tuning:

Once the model is trained, it is evaluated using separate test data to assess its generalization and performance on unseen examples. Various evaluation metrics are used to measure the model's accuracy, precision, recall, or other relevant metrics, depending on the task. If the model's performance is not satisfactory, fine-tuning may be performed by adjusting hyperparameters or modifying the model architecture.

8. Deployment and Integration:

After the model is trained and evaluated, it is ready for deployment. The model is integrated into the target system or application where it will be used to make predictions or decisions. This may involve developing APIs, building user interfaces, or integrating the model into existing software infrastructure. Proper testing and validation are crucial during this step to ensure the deployed model functions as intended.

9. Monitoring and Maintenance:

Once the AI system is deployed, it is important to continuously monitor its performance, gather feedback, and address any issues that arise. This may involve monitoring data quality, model drift, or updating the model periodically to adapt to evolving data patterns. Ongoing maintenance and updates ensure the AI system remains accurate and effective in real-world scenarios.

It is important to note that the specific steps and their order may vary depending on the nature of the AI system, the problem domain, and the available resources.

2.3 Types of artificial intelligence systems

Advantages and disadvantages of each type of artificial intelligence system

Different types of artificial intelligence systems, such as rule-based systems, probabilistic systems, and neural networks, have distinct characteristics, advantages, and limitations. Let's compare and contrast these types:

1. Rule-based Systems:

Rule-based systems use a set of predefined rules and logical reasoning to make decisions or perform tasks.

Advantages:

- Transparency: The rules are explicit and can be easily interpreted, making the system more transparent and understandable.

- Ease of development: Rule-based systems can be developed and modified by domain experts without extensive programming or data-intensive training.

Limitations:

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- Limited flexibility: Rule-based systems rely on predefined rules, making them less adaptable to new or complex situations that may require nuanced decision-making.

- Maintenance overhead: As the number of rules grows, maintaining and updating the system becomes challenging and may lead to rule conflicts or inconsistencies.

2. Probabilistic Systems:

Probabilistic systems use probability theory to represent uncertainty and make decisions based on probabilities.

Advantages:

- Ability to handle uncertainty: Probabilistic systems can handle incomplete or noisy data by assigning probabilities to different outcomes or hypotheses.

- Decision-making under uncertainty: Probabilistic systems can make decisions based on the likelihood of different outcomes, incorporating probabilistic reasoning.

- Limitations:

- Computational complexity: Probabilistic systems can be computationally demanding, especially when dealing with complex models or large datasets.

- Difficulty in acquiring accurate probabilities: Obtaining accurate probability estimates may require significant amounts of data or expert knowledge.

3. Neural Networks:

Neural networks are a type of AI model inspired by the structure and function of the human brain. They consist of interconnected nodes (neurons) organized in layers and can learn patterns and relationships from data.

Advantages:

- Ability to learn complex patterns: Neural networks excel at learning intricate patterns in data and can automatically extract features, making them suitable for tasks like image recognition and natural language processing.

- Adaptability: Neural networks can learn from new data and adjust their internal parameters, allowing them to adapt to changing circumstances.

Limitations:

- Black-box nature: Neural networks can be challenging to interpret due to their complex internal structure. Understanding why a neural network makes a particular decision may be difficult.

- Data dependency: Neural networks typically require large amounts of labelled training data to achieve high performance, making them more reliant on data availability and quality.

4. Hybrid Systems:

Hybrid AI systems combine different approaches, such as rule-based systems with probabilistic reasoning or neural networks with rule-based components, to leverage the strengths of each approach.

Advantages:

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- Synergy of multiple techniques: Hybrid systems can harness the strengths of different AI approaches, compensating for each approach's limitations.

- Improved performance: Combining multiple techniques can lead to improved accuracy and robustness in decision-making and problem-solving.

Limitations:

- Increased complexity: Hybrid systems can be more complex to design, implement, and maintain due to the combination of different components.

- Potential integration challenges: Integrating different AI techniques may require careful design and engineering to ensure seamless cooperation between the components.

It's worth noting that the advantages and limitations mentioned above are general characteristics and can vary depending on the specific implementation, problem domain, and available data. The choice of AI system type depends on the requirements of the task, available resources, and the trade-offs between interpretability, flexibility, and performance.

Possible applications for each type of artificial intelligence systems

Various types of AI systems, including rule-based systems, probabilistic systems, and neural networks, have different applications based on their specific characteristics and strengths. Here are some possible uses for each type:

1. Rule-based Systems:

- Expert Systems: Rule-based systems excel at capturing expert knowledge and can be used to build expert systems that provide intelligent advice or decision support in specific domains. For example, a rule-based system can be developed to diagnose medical conditions based on a set of medical rules and patient symptoms.

- Business Rules Engines: Rule-based systems are used in business environments to automate decision-making based on predefined rules. They can be employed in areas such as fraud detection, risk assessment, or compliance management, where specific rules need to be enforced.

- Workflow Automation: Rule-based systems can be used to automate workflow processes by defining rules for routing, validation, and decision-making. This can improve efficiency and reduce errors in areas like document processing or customer support ticket routing.

Areas of application of rule-based AI systems include:

Customer Support and Chatbots: Rule-based AI systems can be used to automate customer support interactions and chatbots. By defining a set of rules and responses, these systems can provide instant assistance to customers, answer frequently asked questions, and guide users through specific processes or troubleshooting steps.

Fraud Detection: Rule-based AI systems play a significant role in fraud detection and prevention. By incorporating a set of predefined rules based on known fraud patterns and indicators, these systems can analyze transactions, detect suspicious activities, and flag potential fraudulent behavior for further investigation.

Compliance and Risk Management: In industries with stringent regulations and compliance requirements, rule-based AI systems can help organizations ensure adherence to specific

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guidelines. These systems can enforce predefined rules related to compliance, risk assessment, data privacy, and security, reducing the chances of non-compliance and mitigating associated risks.

Diagnosis and Decision Support in Medicine: Rule-based AI systems find applications in medical diagnosis and decision support. By incorporating medical rules based on expert knowledge and established guidelines, these systems can analyze patient symptoms, medical history, and test results to provide insights, suggest potential diagnoses, or recommend appropriate treatment options.

Workflow Automation: Rule-based AI systems are commonly used to automate workflows and business processes. By defining rules for routing, validation, and decision-making, these systems can streamline operations, reduce manual effort, and ensure that tasks are executed according to predefined guidelines and criteria.

Recommendation Systems: Rule-based AI systems can be utilized in recommendation engines. By implementing a set of rules based on user preferences, historical data, and product attributes, these systems can provide personalized recommendations for products, services, movies, or content based on specific rules and criteria.

Decision Support in Finance and Investing: Rule-based AI systems can assist in financial decision-making and investment strategies. By incorporating predefined rules based on market trends, economic indicators, risk profiles, and investment preferences, these systems can provide recommendations, alerts, or portfolio management guidance to investors or financial institutions.

Quality Control and Manufacturing: Rule-based AI systems can be used in quality control processes, particularly in manufacturing environments. By defining rules for identifying defects, anomalies, or deviations from expected standards, these systems can assist in real-time monitoring, inspection, and quality assurance, ensuring that products meet the desired specifications.

Routing and Logistics Optimization: Rule-based AI systems can optimize routing and logistics operations. By incorporating predefined rules based on factors such as distance, traffic conditions, delivery priorities, and constraints, these systems can automate and optimize the allocation of resources, route planning, and scheduling, improving efficiency and reducing costs in transportation and logistics operations.

2. Probabilistic Systems:

- Recommendation Systems: Probabilistic systems are commonly used in recommendation engines to suggest products, movies, or content based on user preferences and past behaviour. These systems leverage probabilistic models like collaborative filtering or Bayesian networks to provide personalized recommendations.

- Natural Language Processing (NLP): Probabilistic models, such as Hidden Markov Models (HMMs) or Conditional Random Fields (CRFs), are used in NLP tasks like speech recognition, part-of-speech tagging, named entity recognition, and machine translation. These models can handle the inherent uncertainty in language and make probabilistic predictions.

- Anomaly Detection: Probabilistic systems are effective in identifying anomalies or outliers in datasets. They can be used for fraud detection, network intrusion detection, or quality control in manufacturing by modelling normal behaviour and detecting deviations from it.

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Use cases for this types of systems:

Recommendation Systems: Probabilistic AI systems play a vital role in recommendation engines. By utilizing probabilistic models like collaborative filtering or Bayesian networks, these systems can analyse user preferences, historical behaviour, and item attributes to provide personalized recommendations for products, movies, music, or content. This enhances user experience and drives engagement in platforms such as e-commerce, streaming services, and social media.

Natural Language Processing (NLP): Probabilistic AI systems are widely used in various NLP tasks. For example, in speech recognition, Hidden Markov Models (HMMs) and Gaussian Mixture Models (GMMs) are employed to model the probabilistic nature of speech patterns and recognize spoken words or phrases accurately. In machine translation, probabilistic models like phrase-based models or neural machine translation models leverage probabilities to generate fluent and accurate translations.

Anomaly Detection: Probabilistic AI systems find applications in anomaly detection across different domains. By modelling normal behaviour and quantifying the likelihood of different outcomes, these systems can identify unusual patterns, outliers, or deviations from expected behaviour. This is useful in fraud detection, network intrusion detection, system monitoring, and quality control, where identifying anomalies is crucial.

Predictive Maintenance: Probabilistic AI systems can be used for predictive maintenance in industrial settings. By analysing sensor data, historical maintenance records, and other relevant information, these systems can predict the likelihood of equipment failures or maintenance needs. This enables proactive maintenance planning, reducing downtime, and optimizing maintenance schedules and resource allocation.

Risk Assessment and Insurance Underwriting: Probabilistic AI systems find applications in risk assessment and insurance underwriting processes. By leveraging historical data and probabilistic models, these systems can evaluate risk factors, estimate probabilities of events, and assess insurance claims. This enables accurate risk evaluation, pricing, and decision-making in insurance industries.

Credit Scoring and Fraud Detection in Finance: In the financial sector, probabilistic AI systems are employed for credit scoring and fraud detection. By analysing customer data, transaction history, and patterns indicative of creditworthiness or fraudulent behaviour, these systems can assess credit risk, determine credit scores, and identify potential fraudulent activities, contributing to secure and reliable financial operations.

Medical Diagnosis and Disease Prediction: Probabilistic AI systems can be applied in medical diagnosis and disease prediction. By incorporating probabilistic models that consider various symptoms, patient history, and diagnostic test results, these systems can assess the likelihood of different diseases or conditions. They can assist healthcare professionals in making accurate diagnoses and predictions, improving patient care and treatment outcomes.

Supply Chain Optimization: Probabilistic AI systems can optimize supply chain operations by considering uncertainties and variability in demand, supply, and logistics. By incorporating probabilistic models, these systems can make informed decisions about inventory management, demand forecasting, production planning, and distribution, minimizing costs, and improving overall supply chain efficiency.

Autonomous Vehicles: Probabilistic AI systems are crucial for autonomous vehicles to navigate complex environments safely. By using sensor data, probabilistic models such as

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Bayesian filters or particle filters enable accurate perception, object tracking, and decision-making in real-time. These systems assess the probabilities of different objects, obstacles, and scenarios to make informed driving decisions.

These use cases illustrate the broad applications of probabilistic AI systems across various industries, showcasing their ability to handle uncertainty, make informed predictions, and improve decision-making in complex and data-driven domains.

3. Neural Networks:

- Computer Vision: Neural networks, particularly convolutional neural networks (CNNs), are widely used in computer vision tasks. They enable image recognition, object detection, facial recognition, image segmentation, and scene understanding. Applications include autonomous vehicles, surveillance systems, medical imaging analysis, and augmented reality.

- Natural Language Processing: Neural networks, such as recurrent neural networks (RNNs) or transformer models like BERT, have revolutionized NLP tasks. They are used for sentiment analysis, language generation, chatbots, question-answering systems, language translation, and text summarization.

- Pattern Recognition: Neural networks are effective in pattern recognition tasks, such as hand gesture recognition, speech recognition, or bioinformatics analysis. They can learn complex patterns and relationships from data, enabling accurate recognition and classification.

Possible use cases where neural network AI systems can be applied:

Computer Vision: Neural networks excel in computer vision tasks such as image recognition, object detection, facial recognition, image segmentation, and scene understanding. These systems can be used in diverse fields, including autonomous vehicles, surveillance systems, medical imaging analysis, augmented reality, and robotics. They enable accurate visual perception and understanding of complex visual data.

Natural Language Processing (NLP): Neural networks have made significant advancements in NLP tasks. For example, recurrent neural networks (RNNs) and transformer models like BERT are used for sentiment analysis, language generation, chatbots, question-answering systems, language translation, and text summarization. These systems can understand and generate human-like language, facilitating effective communication between humans and machines.

Speech Recognition: Neural networks are widely employed in speech recognition systems, converting spoken language into written text. Recurrent neural networks, convolutional neural networks (CNNs), and hybrid models like connectionist temporal classification (CTC) networks are used to accurately transcribe speech in applications such as voice assistants, transcription services, and voice-controlled devices.

Gesture Recognition: Neural networks can be used in gesture recognition applications, enabling computers or devices to interpret and respond to hand gestures. These systems utilize deep learning models such as CNNs or recurrent neural networks to analyse video or image data, allowing for intuitive human-computer interaction in applications like virtual reality, gaming, and sign language recognition.

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Recommendation Systems: Neural networks play a crucial role in recommendation engines. Collaborative filtering models, such as matrix factorization or deep learning-based approaches like neural collaborative filtering, are used to analyse user preferences and item characteristics. These systems provide personalized recommendations for products, services, movies, or content, improving user engagement and satisfaction.

Autonomous Systems and Robotics: Neural networks are integral to autonomous systems and robotics, enabling perception, decision-making, and control. For example, in autonomous vehicles, neural networks process sensor data from cameras, lidar, and radar to detect objects, understand the environment, and make driving decisions. In robotics, neural networks are used for tasks like object grasping, motion planning, and robot control, allowing machines to interact with the physical world intelligently.

Healthcare and Medical Diagnostics: Neural networks find applications in healthcare, assisting with medical diagnostics, image analysis, and disease prediction. For instance, deep learning models can analyse medical images like X-rays, MRIs, or pathology slides to aid in the detection and diagnosis of diseases. Neural networks can also predict patient outcomes, identify patterns in patient data, and provide decision support for treatment planning.

Financial Forecasting and Trading: Neural networks are utilized in financial applications such as stock market prediction, algorithmic trading, and risk assessment. These systems can analyze historical financial data, news sentiment, and market indicators to forecast trends, identify investment opportunities, and optimize trading strategies. Neural networks enable data-driven decision-making in the dynamic and complex world of finance.

Drug Discovery and Genomics: Neural networks are employed in drug discovery and genomics research. These systems can analyse large-scale genomic data, identify patterns, and predict biological activities or drug-target interactions. Neural networks contribute to the development of personalized medicine, drug design, and genomic research advancements.

These use cases demonstrate the versatility and wide-ranging applications of neural network AI systems, showcasing their ability to handle complex data, learn intricate patterns, and enable intelligent decision-making in various domains.

It's important to note that these uses are not mutually exclusive, and there can be overlaps and combinations of different AI systems for specific applications. Additionally, hybrid AI systems that combine multiple techniques can leverage the strengths of different approaches to address complex problems effectively.

2.4 Artificial intelligence tools and platforms for companies and individuals

Popular AI tools and platforms

There are many artificial intelligence tools and platforms available in the market that can help businesses and individuals leverage the power of AI for various purposes. Some of the common AI tools and platforms are:

- Microsoft Azure Machine Learning: This is a cloud-based platform that allows users to build, train, deploy, and manage machine learning models using a drag-and-drop interface or code. Users can also access pre-built models and algorithms for common tasks such as image classification, sentiment analysis, anomaly detection, etc. Azure Machine Learning

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also supports automated machine learning, which can find the best model for a given dataset and objective.

More information: https://builtin.com/artificial-intelligence/ai-tools

- Google Cloud Prediction API: This is a service that provides access to Google's machine learning capabilities for data analysis and prediction. Users can upload their data to Google Cloud Storage and use the Prediction API to create and train models, make predictions, and evaluate performance. The Prediction API can handle both numerical and categorical data, as well as text data for natural language processing.

More information https://www.spiceworks.com/tech/artificial-intelligence/articles/best-ai-tools/

- IBM Watson: This is a suite of AI services and applications that can help users with various tasks such as conversational AI, natural language understanding, visual recognition, speech to text, text to speech, tone analysis, personality insights, etc. Watson can also be used to build custom solutions for specific domains and industries, such as healthcare, education, finance, etc.

More information: https://wachemo-elearning.net/courses/introduction-to-emerging-technologies/lessons/chapter-3-17/topic/3-7-ai-tools-and-platforms/

- TensorFlow: This is an open-source framework for developing and deploying machine learning and deep learning models. TensorFlow supports a wide range of applications, such as computer vision, natural language processing, recommender systems, generative models, etc. TensorFlow also offers tools and libraries for data processing, model building, testing, debugging, visualization, etc.

More information with examples: https://www.forbes.com/sites/bernardmarr/2023/02/28/beyond-chatgpt-14-mind-blowing-ai-tools-everyone-should-be-trying-out-now/

- Infosys Nia: This is an enterprise-grade platform that combines artificial intelligence, machine learning, big data analytics, and automation to help businesses improve their processes and outcomes. Nia can be used for tasks such as data discovery, data cleansing, data integration, data analysis, data visualization, predictive modeling, prescriptive modeling, etc. Nia can also automate repetitive and complex tasks across various functions and domains.

- Wipro HOLMES: This is an artificial intelligence platform that offers solutions for various industries and domains such as banking, retail, healthcare, manufacturing, energy, etc. HOLMES can help users with tasks such as cognitive automation, cognitive computing, cognitive interaction, cognitive insight, etc. HOLMES can also integrate with existing systems and platforms to enhance their capabilities.

- API.AI: This is a platform that enables users to build conversational agents or chatbots that can interact with users via text or voice. Users can design the flow and logic of the conversation using a graphical interface or code. Users can also use pre-built agents for

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common scenarios such as weather, news, trivia, etc. API.AI supports multiple languages and platforms such as Facebook Messenger, Slack, Skype, etc

Please note that many examples provided are either paid either the whole platforms, or services, with exception of open source systems like TensorFlow, which while being very robust, is not well suited for beginners due to programming language (Python) and large variations in libraries, examples, etc.

Example of using one of the AI tools

An example of using TensorFlow to train an AI model to recognize and differentiate images of cats and dogs.

The TensorFlow is written in Python programming language, so typically a computer with installed Linux (or virtual machine) is needed. Windows and MacOS are also supported, but perhaps less popular and with lesser access to various libraries.

To start using TensorFlow, you'll need the following:

1. Python: TensorFlow is implemented in Python, so you'll need to have Python installed on your system. You can download Python from the official Python website (https://www.python.org) and follow the installation instructions specific to your operating system.

2. TensorFlow: Once you have Python installed, you can install TensorFlow using the pip package manager. Open a command prompt or terminal and run the following command:

```
pip install tensorflow
```

This will install the latest stable version of TensorFlow. If you want to install a specific version, you can specify it in the command. For example:

```
pip install tensorflow==2.5.0
```

TensorFlow also offers additional packages such as TensorFlow GPU for utilizing GPUs for faster computations. You can refer to the TensorFlow documentation for more details on different installation options.

3. Libraries and Dependencies: TensorFlow relies on several additional Python libraries and dependencies. These dependencies are usually installed automatically when you install TensorFlow using pip. However, it's good practice to have other common libraries like NumPy, Matplotlib, and Pandas installed as well, as they are often used in conjunction with TensorFlow.

You can install these libraries using pip:

```
pip install numpy matplotlib pandas
```

Again, make sure to check the specific installation instructions and requirements for your operating system.

Once you have completed these steps, you should be ready to start using TensorFlow.

Once you have completed those steps, you can start using TensorFlow to build and train cats and dogs recognition model.

Let's start importing the necessary libraries:

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```
import tensorflow as tf

from tensorflow import keras

from tensorflow.keras import layers
```

Next, we'll prepare the dataset. In this example, we'll build a convolutional neural network (CNN) using TensorFlow's high-level API, Keras, to classify images from the CIFAR-10 dataset.

The CIFAR-10 dataset is a popular benchmark dataset widely used in the field of computer vision for image classification tasks. CIFAR stands for the "Canadian Institute for Advanced Research," where the dataset was originally created. It consists of 60,000 32x32 color images in 10 different classes, with 6,000 images per class. The dataset is split into 50,000 training images and 10,000 testing images.

Assuming you have a directory containing separate subdirectories for cats and dogs, each containing corresponding images, we can use the `ImageDataGenerator` class from Keras to load and preprocess the data:

```
image_size = (128, 128)

batch_size = 32

train_data = tf.keras.preprocessing.image.ImageDataGenerator(

    rescale=1.0 / 255,

    shear_range=0.2,

    zoom_range=0.2,

    horizontal_flip=True,

    validation_split=0.2

)

train_generator = train_data.flow_from_directory(

    "path/to/dataset",

    target_size=image_size,

    batch_size=batch_size,

    class_mode="binary",

    subset="training"

)

validation_generator = train_data.flow_from_directory(

    "path/to/dataset",

    target_size=image_size,

    batch_size=batch_size,
```

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```
    class_mode="binary",
    subset="validation"
)
```

Now, let's define our CNN model using Keras:

```
model = keras.Sequential([
                layers.Conv2D(32,    (3,    3),    activation="relu",
input_shape=(image_size[0], image_size[1], 3)),
    layers.MaxPooling2D(pool_size=(2, 2)),
    layers.Conv2D(64, (3, 3), activation="relu"),
    layers.MaxPooling2D(pool_size=(2, 2)),
    layers.Flatten(),
    layers.Dense(64, activation="relu"),
    layers.Dense(1, activation="sigmoid")
])
```

We'll compile the model by specifying the loss function, optimizer, and metrics:

```
model.compile(
    loss=keras.losses.BinaryCrossentropy(),
    optimizer=keras.optimizers.Adam(),
    metrics=["accuracy"]
)
```

Next, we'll train the model using the training data:

```
epochs = 10
model.fit(
    train_generator,
    steps_per_epoch=len(train_generator),
    epochs=epochs,
    validation_data=validation_generator,
    validation_steps=len(validation_generator)
)
```

Once the model is trained, we can save it for external use:

```
model.save("path/to/save/model")
```

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Now you can use the saved model for inference on new images or share it with others for external use. To load the model, you can use the following code:

```
loaded_model = tf.keras.models.load_model("path/to/saved/model")
```

You can then use the `loaded_model` to make predictions on new images.

Remember to replace the `"path/to/dataset"` and `"path/to/save/model"` with the appropriate paths on your system.

That's it! You have successfully used TensorFlow to build an image recognition model for classifying cats and dogs, and saved it for external use.

2.5 Implications for AI implementation

Considerations about social, ethical and privacy related issues about AI

The development and deployment of artificial intelligence (AI) systems bring forth a range of ethical, social, and legal implications, some of which have no corresponding legal framework.

Privacy:

The collection and use of personal data by AI systems raise concerns about privacy. For instance, facial recognition technologies implemented in public spaces can capture and analyse individuals' biometric data without their consent, potentially infringing on their privacy rights. Additionally, AI-powered algorithms used by social media platforms may gather extensive user data to personalize content, leading to concerns about data security and the exploitation of personal information for targeted advertising or manipulation.

Bias and Fairness:

AI systems trained on biased or unrepresentative data can perpetuate discrimination and reinforce societal biases. For example, AI-based hiring tools may inadvertently discriminate against certain demographics if the training data is biased towards a particular group. Such biases can have significant implications for employment opportunities and perpetuate existing inequalities. Addressing biases in AI systems requires careful data selection, pre-processing, and regular auditing to ensure fairness and mitigate discriminatory outcomes.

Accountability and Transparency:

The lack of transparency in AI decision-making processes raises concerns about accountability. For instance, in the context of algorithmic decision-making in criminal justice systems, the use of AI in determining bail, sentencing, or parole decisions may lack transparency, making it difficult for individuals to understand how such decisions were reached. Establishing mechanisms for explainability and interpretability in AI models can ensure transparency, enabling individuals to contest decisions and hold responsible parties accountable.

Ethical Decision-Making:

AI systems can face ethical dilemmas when making decisions that impact individuals or society. For example, autonomous vehicles may encounter situations where they must make split-second decisions, such as choosing between two potential accidents. Determining the ethical frameworks for such decisions, such as prioritizing the safety of passengers versus pedestrians, requires societal consensus and careful consideration of ethical values.

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Developing ethical guidelines and regulations for AI decision-making can ensure that AI systems align with human values and act ethically in complex scenarios.

Employment Disruption:

The adoption of AI technologies and automation can disrupt the job market, leading to job displacement and changes in labour dynamics. For instance, advancements in robotic automation may replace certain manual or repetitive tasks, affecting workers in manufacturing industries. Additionally, the rise of AI-powered chatbots and virtual assistants can impact customer service jobs. Addressing the potential socioeconomic inequalities arising from AI-driven automation requires proactive measures, such as retraining programs, skill development initiatives, and policies to support affected workers' transition to new employment opportunities.

Intellectual Property and Ownership:

AI systems that generate creative outputs, such as artwork or inventions, raise questions about intellectual property rights and ownership. For example, AI-generated artwork has gained attention, leading to debates about who holds the copyright and artistic ownership. Similarly, AI systems that assist in inventing new technologies raise questions about the attribution of patents. Determining legal frameworks that address ownership and intellectual property rights in AI-generated content is crucial to ensure fairness and incentivize innovation while respecting the rights of human creators.

Safety and Security:

AI systems deployed in physical environments, such as autonomous robots or critical infrastructure systems, raise concerns about safety and security. For instance, autonomous vehicles must navigate roads safely to avoid accidents, and vulnerabilities in their AI systems could be exploited by malicious actors. Additionally, AI-powered systems used in healthcare or financial sectors must adhere to stringent security standards to protect sensitive data from breaches or unauthorized access. Establishing robust safety measures, security protocols, and regulatory frameworks is essential to minimize risks associated with AI systems and ensure public safety.

By understanding and addressing these ethical, social, and legal implications, we can promote the responsible development and deployment of AI technologies, fostering trust, fairness, and accountability in their use.

2.6 Summary

In conclusion, this unit offers an extensive exploration of engagement with artificial intelligence (AI), unveiling its transformative potential as one of the most revolutionary technologies of our era. Central to AI functionality is its technical architecture, and learners gain essential insights into data collection, pre-processing, model training, and implementation for successful AI integration. Throughout this unit, learners delve into diverse types of AI systems, discerning their merits, drawbacks, and practical applications. The wide array of AI tools and platforms available to individuals and companies democratize the technology, empowering users with limited expertise to develop tailor-made AI solutions to address unique needs. The unit also addresses critical societal aspects, probing into the impact of AI on privacy, employment, biases, and decision-making processes. By understanding these implications, stakeholders are better equipped to address challenges and develop AI systems that adhere to ethical and regulatory standards. Achieving the set objectives, learners familiarize themselves with AI concepts and subfields, grasp the

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technical architecture and workflow, and explore examples of AI tools and platforms. They also gain a nuanced comprehension of the social, ethical, and privacy implications of AI implementation. Ultimately, this unit provides learners with a comprehensive understanding of AI engagement, empowering them to responsibly embrace its transformative power and make informed decisions in an ever-evolving world shaped by artificial intelligence.

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Unit 3: The process aspects of AI

3.1 Introduction

The media and marketing hype around AI cannot be overlooked, but the situation is actually not at all simple and we are constantly encountering many obstacles and complications that prevent the easy application of AI across industries. The media and consulting firms address these issues in well-crafted studies, but few discuss the real obstacles that managers encounter in their efforts to implement AI, or the opportunities to overcome them.

Ericsson conducted a survey of 2,525 executives responsible for AI and advanced data analytics, and summarizes the findings of companies that have adopted or are adopting these technologies in its Industry Lab series of studies focused on researching trends in the enterprise environment. Although the companies surveyed have reached different levels of AI maturity (categorised as leaders, followers and beginners), they have one thing in common - they have all faced significant hurdles in their adoption. The main problem, however, is not the technology.

Learning Phase (Subchapter) Title	Learning Objective Title	Learning Objective Description	Fine Learning Objective Title	Fine Learning Objective Description
Obstacles and how to overcome them	Motivation to implement AI	Motivation to implement artificial intelligence	Motivation to implement AI	You will understand the basic benefits of implementing AI
	Risks and opportunities	The chapter discusses the risks that AI offers and tries to refute or explain some threats.	Risks and opportunities	Understand the risks and concerns that AI brings and see real examples
	Why lead young people to learn about AI?	The chapter explains why it is important to work and learn to use AI from the perspective of a student, employee, or entrepreneur	Why lead young people to learn about AI?	The student understands the importance of AI for his/her future and can name individual reasons to use AI

3.2 Obstacles and how to overcome them

Motivation to implement AI

Motivation to implement AI in companies

The main motivation for businesses to adopt new technologies in general is to increase productivity, and it is also the most frequently cited reason for adopting AI or advanced data analytics, with 62% of respondents in the survey saying so. There is a strong cultural

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element to companies' ability to adopt new technologies. To meet the quota of 500 managers responsible for AI or advanced data analytics per country, the experts at Ericsson had to reach over 3,000 respondents in the UK, but only around 700 respondents in China, to their amazement. It was generally easier to reach the required number in Asia than in Western countries.

One reason for this may be the generally different attitudes towards technology. A time series analysis of Ericsson ConsumerLab surveys shows that in 2000, 16% of respondents in China and India agreed with the statement "I always look for the most technically advanced product available", compared to only 10% in the UK, Germany and the US. In 2020, 27% of respondents in India and China agreed, but only 17% in the UK, Germany and the US. In other words, Western countries have barely reached the level of interest in technology that prevailed in Asian countries two decades earlier.

A similar pattern can be seen among executives in the current survey, with 78% of respondents in China having adopted AI or advanced data analytics, compared to just 24% in the UK. Although Western countries are clearly lagging behind in AI adoption, they still have time to catch up. Further analysis by Ericsson shows that the higher the level of AI or advanced data analytics adoption an enterprise achieves, the more complications it will start to encounter. And most of them lie in people or company culture.

The main findings of the study conducted by Ericsson

- 99% of all respondents have encountered challenges implementing AI or advanced data analytics in their business unit, and 91% have encountered challenges in all three categories examined: technology, organization, and people/culture.
- The proportion of initiatives that encounter problems increases with their maturity - the more advanced, the more complicated the deployment.
- 87% of respondents said that people and culture issues were more complex than technology or organizational issues. Similarly, 94% had implemented more strategies focused on human and cultural aspects than other categories.
- 69% of executives responsible for AI in their companies expect a constant influx of new AI and analytics applications - ones that will support process and organizational change.
- A full 63% of AI executives say the focus of businesses will shift from producing products and providing services to creating AI algorithms and models. In such a post-transformation phase, the enterprise may settle into a state where the only constant will be changes based on data evaluation.

Note

"The main motivation for big tech giants to invest in AI is primarily in the benefits of applied machine learning. This is already having a big impact on search, the quality of translations or spam filtering and better ranking of social media posts,"

Risks and opportunities

Advantages of artificial intelligence

1. Reduction of human intensive labour

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AI has been instrumental in reducing human intensive work through intelligent automation. According to the Oxford Economic Report in June 2019, there are more than 2.25 million robots deployed worldwide (a threefold increase in the last decade). Now, in many factories, all heavy lifting, transporting, and other ground operations are performed by AI-enabled robots. This saves a lot of human effort that can be better used in more productive activities.

Example

Amazon will deploy more than 100,000 AI-based Kiva robots in its fulfilment centre. The use of AI-enabled robots not only reduces human effort in performing physically demanding work like carrying large amounts of inventory from one shelf to another, but also increases safety in the workplace. These Cyborgs can load and unload one full trailer of inventory in less than 30 minutes, which took more than a few hours for human workers.

2. Increasing efficiency in the pharmaceutical industry

AI is a boon to the pharmaceutical and healthcare industries. According to an MIT study, only 13% of drugs go through clinical trials, further meaning it costs Pharma companies millions of dollars to get any of their drugs through clinical trials. Therefore, to ensure better use of their R&D budget, Pharma companies are deploying AI to increase the chances of their drugs clearing clinical trials. Various machine learning algorithms help scientists in finding the right composition of different salts in drugs by analysing historical data related to genes, chemical reactions, and other attributes.

Example

Novartis, a leading pharmaceutical company, uses Machine Learning Algorithm to find out which compound is best at fighting the diseased cells being studied. Previously, this process involved manual microscopic examination for each sample, which was both time-consuming and prone to human error. With machine learning-based algorithms, they can perform simulations in real time and get more accurate results sooner.

3. Financial sector transformation

Most financial applications revolve around analyzing past data to achieve better results. Not surprisingly, Artificial Intelligence, whose company USP analyzes past data, has had tremendous success in the financial sector. AI has wide-ranging applications in the financial industry, from risk assessment, fraud detection, algorithm-based trading, financial advice and financial management, to name a few.

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Example

Paypal uses an advanced Deep Learning Algorithm to detect fraudulent transactions. Paypal processes large amounts of transaction data, processing more than $235 billion in payments from 4 billion transactions made by more than 170 million users. Paypal uses a Deep Learning algorithm to analyse a large variety of data and compare transactions to a pattern of fraudulent transactions stored in their database. Based on this pattern comparison, it can detect fraudulent transactions from normal transactions.

4. Faster and easier customer service using AI-type chats

The previous version of Chat-Bots interactions were very time consuming and frustrating. Bots used to hit loops and could only assist in predefined tasks. Chat-bots working with AI using natural language processing have a better understanding of human interactions and can learn on their own, and are therefore much more adept at providing an adequate response to customers.

Example

Bank of America's Erica virtual assistant is one such example of an AI-enabled chat-bot. It has already helped 7 million clients since its launch in June 2018. Erica uses Artificial Intelligence, Predictive Analytics and Artificial Neural Network to satisfy more than 50 million client requests it received last year. Requests range from common banking tasks such as bank balance information, payment settlement, to complex tasks such as investment planning and budgeting proposals.

5. Improving road safety

According to a World Health Organisation report, more than one million people die in road accidents every year. Artificial intelligence plays a major role in reducing such deaths. Many companies have started using AI to record and analyze minute by minute details regarding the driving pattern of different drivers ranging from lane discipline, following traffic rules, distance maintained with other vehicles on the road. The data collected in this way is used by AI applications to provide safety recommendations to drivers and help automobile companies come up with safer vehicles.

Example

Microsoft is experimenting with HAMS (Harnessing Auto-Mobiles for Safety) to make Indian roads safer. It takes into account two factors - the condition of the driver and the position of his vehicle in relation to other vehicles. It uses a front and rear camera mounted in front of the driver's seat. The front camera is used to measure the driver's physical condition such as fatigue by detecting eye movement and yawns. These are detected using the aspect ratio of the mouth. The rear camera analyses the lane and distance from other vehicles. All this data is analyzed by AI applications using Edge-based processing, and alerts for safety recommendations are generated in real time.

6. Predicting and enabling faster response to a disaster

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Artificial intelligence has become a silver lining for us in the face of calamity. Now Artificial Intelligence applications are being deployed to prevent natural disasters using various pattern recognition algorithms. It is also being used to mitigate losses after such disasters by assisting in disaster relief work. AIDR (Artificial Intelligence for Disaster Response) is widely used for this purpose.

Example

AIDR was deployed in the rescue efforts after the Nepal earthquake (2015). Volunteers and rescue workers were able to reach affected victims quickly using AIDR. AIDR uses social media analytics to analyze all tagged tweets. The information from these tweets helped rescuers reach the affected area quickly, but also assisted them in categorizing the areas by urgency to better direct rescue efforts.

Threats of AI

It is clear from the above that artificial intelligence has a lot to offer us. However, there are also some pitfalls.

1. Moral considerations

First we must mention the often discussed moral, ethical aspect. In this context, there is controversy about whether it is right for humans to try to create an intelligent being at all. Whether he should interfere with Mother Nature's "craft" and whether mankind is not cutting a branch under itself.

2. Revolt of the machines?

It probably sounds like a cliché from the aforementioned science fiction genre, but the fact is that if we are able to create machines more intelligent than ourselves, they might outsmart us and we might lose control of them, as Sam Harris states in his TED talk which is addresses the question of whether we can create artificial intelligence at this level without without losing control of it.

3. Killer robots

However, even if the above does not happen and intelligent machines remain tools of humans, in the wrong hands they could do a lot of harm. We don't even need to go into the distant future, just think about intelligent weapons.

Consider a weapon that has the ability to get itself to its target, cannot be caught and never misses. It never falters. It has no emotion or conscience. A man could still abandon his intention at this point, but not a machine. It has no agenda.

These considerations led to the launch of the Stop Killer Robots campaign which aims to make such weapons ("killer robots") to ban them. Elon Musk, founder of OpenAI, has also supported this move and CEO of Tesla and SpaceX.

On 18 November this year, the United Nations even took up the issue. Representatives of twenty-two countries advocated stopping the development and banning the use of these weapons. However, the meeting was not as productive as its promoters had hoped. It was agreed that talks on the subject would be held next year. However, Mary Wareham, global coordinator of the Stop Killer Robots campaign, said there was no time to waste just talking about the issue, as many armies and other organisations are already investing heavily in

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making these weapons a reality. In the end, this meeting led to two agreements. Most nations agreed that legally binding means must be put in place to control the use of these types of weapons, and that some form of human control over the weapons must be maintained.

4. Unemployment

Another frequently discussed problem that the development of artificial intelligence may cause is the increase in unemployment. If the same work can be done by machines that do not need to be paid, do not get tired so that their performance does not decline and they are not in danger of making mistakes, do not even need to sleep, and can therefore work for any length of time, it will be more profitable for employers (if the cost of acquisition and operation is not prohibitive) to fill these positions with machines. Professions that do not require too much creativity and a human approach could therefore be at risk.

However, according to Ray Kurzweil, Google's chief engineer, there is no need to worry about unemployment. While it is likely that many existing jobs will disappear as AI becomes more widespread, many new ones will be created. However, the fact is that we are currently unable to say what these positions will be and what they will entail.

Views on artificial intelligence

Opinions on artificial intelligence vary, both among the general population and among top scientists. Stephen Hawking, for example, has expressed considerable concern in this regard. He believes that AI could eventually replace the human race entirely. He even states that it is only a matter of time before humanity will have to leave the Earth in search of a new home. He foresees this happening within the next hundred years. He also mentions the possible negative effects on middle-class jobs. Hawking is inclined to think that some government control of these technologies needs to be put in place and is in favour of banning the development of artificial intelligence for military purposes.

Elon Musk, the founder and CEO of SpaceX and Tesla, agrees that AI could spell the end of humanity and that the field should be controlled and regulated as it has huge destructive potential, especially in conjunction with automatic weapons. However, he does not reject artificial intelligence, but merely stresses that a way must be found to ensure that these potential risks do not undermine the potential benefits of AI.

On the contrary, Bill Gates, co-founder of Microsoft, argues that the so-called 'control problem' is not something so immediate that we need to worry about it. He sees more positives in AI, such as helping with repetitive activities or increasing productivity in the office, but admits there are some question marks, such as how to help people whose jobs will be replaced by AI.

Ray Kurzweil, known for his surprisingly accurate visions of the future, translates in this regard more of a vision of coexistence with AI. One of his latest visions is that AI will equal human intelligence as early as 2029, when the Turing Test is met. The so-called singularity, the point at which technology surpasses human intelligence, will then occur by 2045, he says. He also predicts that human bodies will gradually be able to be completely mechanised, which could even mean immortality.

Why lead young people to learn about AI?

Most of us encounter AI applications every day, but we rarely understand the technology behind it. This literacy gap, coupled with their frequent use, can lead to vulnerability and ease of manipulation. It should be our goal to ensure that the younger generation understands not

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only the potential of artificial intelligence, but also the risks that this disruptive technology poses.

Young people commonly use AI (Artificial Intelligence), but despite this, they often cannot recognise or describe when and how it works. This increases the AI literacy gap. That's why AI and education experts are highlighting the lack of or insufficient integration of AI education in schools so that all students can become critical users of technology.

The core principles of AI should become basic knowledge, much like science knowledge - for example, the periodic table of elements or electromagnetism.

Let's help young people with their future careers

On the one hand, AI will bring significant benefits to users, businesses and economies (increasing productivity and economic growth), but on the other hand it will cause a loss of current jobs and some professions.

While not all occupational fields will be replaced by AI, people with AI skills are likely to be better valued in the labour market than those who lack AI literacy.

Important

A 2017 McKinsey report estimated that by 2030, it may be:
15% of global working time automated
60 % Professions have almost a third of work activities that could be automated.

There will also be new professions that do not exist today, just as technology has caused in the past.

Note

Current second graders will reach 30 around 2042. Studying AI in primary school will give them a competitive career advantage, and not only in technical (or IT) professions. AI is already significantly changing jobs in almost every field of human activity. It can be assumed that knowledge of it will be required in most professions in the future, similar to the need to be able to use computers for work.

Let's prepare the young generation for the future

AI is one of the most emerging industries today. It can also make a significant contribution to tackling the climate crisis, enabling more informed decision-making in reducing carbon emissions in industries or suggesting how to provide access to renewable energy. On the other hand, the challenge for the future is how to reduce the not insignificant energy consumption for the actual operation of AI.

General knowledge and development of AI will increase the competitiveness of society. For example, in Hong Kong, research on AI curriculum is already underway for pre-school education, and in Korea, AI teaching is systematically introduced in primary schools. In the US, a similar curriculum is being developed.

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A mature society, prepared for such a revolutionary technology as AI, can better defend itself against the undermining of democracy by radicalised sections of society, aided by social networks and their AI-based algorithms.

Artificial intelligence is bringing great progress in many directions and fields. But it also raises concerns. For example, that it will be used unethically, promote racial prejudice, spread fake videos, take jobs. In order for the younger generation, who will be the creators, consumers and users of AI, to enjoy its benefits and prevent its abuse, they should understand its workings, benefits and limitations. It must ensure that it is used ethically and without prejudice.

Artificial intelligence is already transforming our lives significantly. It should be our aim to ensure that the younger generation understands its impact and potential for the future. It is important that children receive truthful information about AI and that they understand the technology that is transforming our lives.

AI literacy and competencies

Based on the AI Curriculum for Elementary School, 2021

AI literacy is a set of competencies that enable an individual to function competently in an AI-connected society. An individual with AI literacy should be able to critically evaluate, interact and collaborate with AI and use it as a tool.

With rapid technological changes in an AI-connected society, the goal of primary schools should be to educate the next generation in the following competencies.

What minimum knowledge about AI should young people have?

- *Concepts and types of AI*
  - The aim is to understand the basic concepts related to artificial intelligence. Identify how AI-based systems differ from "standard" algorithm-based systems.
- *Problem solving and search*
  - E.g. knowledge of the principles of search algorithms.
- *Algorithmic reasoning*
  - Understanding of the principles of computer models that mimic human reasoning and logical inference.
- *Data and machine learning*
  - Understanding of machine learning algorithms that find patterns from data.
- *Applications using AI*
  - For example, computer vision, speech recognition, optical text recognition, and machine translation.

What minimum skills are required?

- *Use of AI tools*
  - Using appropriate AI tools to solve problems.
- *Computational thinking and programming*
  - Refers to the ability to program simple AI applications, ultimately developing students' computational thinking skills.

What Attitude does the young generation need?

- *Social impact and collaboration with AI*

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- Developing students' ability to consider, through examples, all aspects of AI with respect to human society. Students should identify the positive and negative impacts of AI on society and have a critical perspective on the use of this technology.

The entry of AI into human decision-making processes raises legitimate ethical concerns. An AI literate citizen should have the ability to use AI for the benefit of humanity.

3.3 Summary

As we have seen, AI can bring many positives, but also a host of potential problems. So we should not take this fact lightly. It is therefore highly advisable to take into account the potential impacts as we move forward and to try to minimise the risks. The idea that this area should be subject to some control is therefore certainly appropriate.

The best way to be prepared for threats and opportunities is to develop your knowledge and skills on the subject and be able to use them in the future. Whatever one's views on artificial intelligence, it is important to remember that artificial intelligence will play an increasingly important role in our lives, and it is up to us to make sure that we can use this situation to our advantage, as well as to the advantage of our environment and society.

3.4 Legal aspects and ethics question of AI Introduction

3.5 Introduction

Learning Phase (Subchapter) Title	Learning Objective Title	Learning Objective Description	Fine Learning Objective Title	Fine Learning Objective Description
Legal aspects and ethics question of AI Introduction	The ethics of AI	The chapter is devoted to ethics AI issues	The ethics of AI	Student Understands the Pitfalls of AI
	Legal aspects of AI	The chapter is devoted to legal AI issues	Legal aspects of AI	The student is familiar with the basic issues of AI and its legal aspects

The ethics of AI

The ethics of artificial intelligence

While ethics has traditionally focused primarily on humans and their actions, much has changed with the development of modern technology. We have come to realise that the achievements of human activity are not morally completely inert and their properties can have both positive and negative impacts on human life and society.

The ethics of artificial intelligence is a relatively young discipline, but its importance is constantly growing. One of the main reasons for this is precisely because machines are increasingly performing more and more tasks and making decisions for us. Often under human supervision, however, in many narrowly defined areas machines have long since

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surpassed us and the near future, at least according to the plans of many technology giants, will involve fully autonomous systems. Autonomous vehicles are a case in point. They are not yet commonly seen in full operation (certainly not without human supervision), but that may soon change. Such vehicles should be able to take us to any point without the need for a human operator. But apart from the many technical aspects, this means that they will have to follow some ethical rules that will allow them to make the right choices.

Important

At the heart of AI ethics is the attempt to create a set of ethical rules that will allow all AI systems to make the right decisions.

But what exactly does that mean? And is it at all realistic to hope to find agreement on a system of a few simple principles that could guide all AI systems, not just in this country, but across Europe, indeed across the world? There are a number of initiatives and documents at national and supranational levels that are based on the belief that this is realistic. So let us take a closer look at what proposals they are coming up with.

Principles

All of the major documents on the ethics of AI agree that there are several basic ethical principles that should guide intelligent systems and machines. These five principles are:

- The principle of non-maleficence,
- the principle of thriving,
- the principle of respect for human autonomy,
- the principle of justice
- and finally the principle of explainability.

If we can somehow incorporate these principles into the decision-making mechanisms of artificial intelligence (at least that is the basic idea), the result will be machines and systems that make ethically correct decisions. There are three approaches to "enriching" AI with ethical principles:

- "top-down" approaches (we program general decision-making procedures),
- bottom-up approaches (we let the AI learn how to act ethically),
- or a combination of both.

But two important questions remain: do these five principles guarantee correct behaviour? And will machines be able to apply them in practice?

A closer look

Let's take another look at all the principles. The first says that AI should not do harm, the second that it should do good, the third that it should respect our autonomous choices and actions, the fourth that it should respect justice, and finally the last, the fifth, that its decisions should be understandable to us humans. In theory, it may seem that all the important areas are covered, but this is not the case.

The first problem concerns the application of these principles in concrete situations.

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What exactly does it mean that artificial intelligence should not harm and should benefit?

Imagine a medical robot that is supposed to perform surgery. Cutting open a human body with a scalpel or a laser beam seems like a clear example of harming, if we understand harming as causing harm. Yet we all agree that surgeons are allowed to do a whole range of procedures that no one else would be allowed to do, because they are clear examples of harm. None of us may deprive another person of a limb, but a surgeon may under certain circumstances. It is clear, therefore, that the 'do no harm' principle is too general and its application may depend significantly on the circumstances. Can we map all these contexts, identify all the exceptions, interpretations, etc., and teach them to artificial intelligence?

In order to know that we are harming someone (causing harm), we actually need to apply quite a wide range of knowledge and skills.

Important

We could say the same about other ethical principles. Artificial intelligence can very easily get into situations where it is not at all sure how it should make a decision, or it may think it has made the right decision, but the decision will not be the right one.

Possible solutions

As we have seen, the principles that should guide AI often require difficult interpretation and in some situations are completely inappropriate. Does this mean that our efforts to endow AI with the tools of ethically correct decision-making are completely lost?

Not necessarily. But we must give up the idea that there is only one system of ethical principles that is applicable to AI in all its forms and applications. Perhaps we should simply not think about the ethics of AI in general terms, taking into account where and what we want to use it for and what our expectations of it are. It is precisely the uses and expectations that can be a good starting point for ethical considerations.

The aforementioned autonomous military systems (I will call them military robots) are an example. We can hardly forbid them from causing harm, because that is the very purpose of their existence and use.

But that does not mean that we cannot provide them with a whole range of ethical principles. But again, their specific nature must be derived from the purpose and context of deployment. Just war theory sets out the conditions for the just conduct of war, which include the distinction between enemy and own combatants and between combatants and civilians. It strictly prohibits attacking civilians and waging war in ways that unreasonably and unjustifiably endanger civilians. Thus, war bots must have certain capabilities (distinguishing between legitimate and illegitimate targets is one of them). And one of the basic ethical principles they must follow is "never attack civilians".

Legal aspects of AI

Artificial Intelligence in EU law

AI is one of the hottest topics being discussed in the context of the EU's Digital Single Market. AI is already part of our everyday lives and can be expected to grow in importance in the coming years. From an economic perspective, AI offers many opportunities for economic growth both in individual Member States and at a pan-European level. At the same time,

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however, it presents many challenges, such as those affecting the labour market, the education system, and the structure of industry and investment. For this reason, in spring 2018, the European Commission initiated a discussion on AI with the aim of developing a coordinated and comprehensive approach by all EU members to the safe and effective development of AI, taking into account the different economic structures of the Member States.

Follow-up EU initiatives on AI

In April 2019, the European Commission followed up with the Communication Building Trust in Human-Centred AI, which was based on the Ethical Guidelines for Ensuring Trustworthiness in AI, in which the HLEG AI Expert Group (HLEG AI) listed 7 requirements for trustworthy AI: human factors and oversight; technical reliability and security; privacy and data governance; transparency; diversity, non-discrimination and fairness; social and environmental wellbeing; and last but not least, accountability.

In February 2020, the White Paper on Artificial Intelligence set out the EU's vision for building trust and excellence in AI research, and in February 2020, the Report on the Safety and Accountability Implications of AI, IoT and Robotics was published.

Draft Regulation for Artificial Intelligence (AI Act)

The draft Regulation laying down harmonised rules for AI (the AI Act) is the most discussed document on AI at European level since its release. It is a proposal for the first legal framework for AI, which aims to provide developers, providers and users of AI systems with clear and consistent requirements and obligations across the internal market under which these systems can be placed on the market, put into service or used, so that they are trustworthy, transparent and operate in accordance with the values, fundamental rights and principles of the European Union.

The AI Act focuses primarily on the risks associated with AI systems and sets out a four-tier risk scale based on several factors and the degree of interference with human rights. Most of the rules are imposed on so-called high-risk AI systems. The Commission proposes to ban completely the use of certain types of AI in the EU, which are contrary to EU values and principles. These include social credit systems or applications using dangerous subliminal techniques. The last part of the draft regulation introduces so-called regulatory sandboxes where innovative AI applications can be tested, which is an important support signal, especially for start-ups and SMEs.

3.6 Summary

Artificial intelligence is used in many fields and for many purposes. It makes decisions about loans, evaluates the results of tenders, trades on the stock market, monitors suspicious transactions on our credit cards, has conversations with us, controls our phones (e.g. Siri), offers us content on social networks, diagnoses diseases, predicts protein structure, analyses huge data sets, transports us in the form of autonomous vehicles, keeps us company (companion robots), treats and cares for us (care robots), can even offer us pleasures of a sexual nature (sex robots).

This diversity of forms of artificial intelligence cannot be bound by a single system of ethical rules. If there is a future for the ethics of AI, it should be a future of thinking about specific systems and specific types of robots from which we have expectations.

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And it is these expectations (cars will drive us, algorithms will inform us, social robots will keep us company, rescue robots will save us, etc.) that should be the fertile substrate from which our reflection will grow specific ethical principles and guidelines tailored to AI systems.

In this section, we have also outlined the main areas of legislation affecting AI in European law. However, it must be stressed that this is by no means an exhaustive overview. Each project in which AI is used is very specific, with various sectoral regulations, for example in the financial sector, playing a significant role. At the same time, this is a dynamic area in which it is essential to keep abreast of the latest regulatory developments, particularly at European level. However, even from this brief overview, it is clear that the legal aspects of the use of artificial intelligence in projects using it cannot be underestimated in any way.

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AI dětem — Vzdělávání v oboru umělé inteligence pro děti

Postupně uvolňujeme vzdělávací materiály, které pomohou základním školám se zavedením umělé inteligence nejen do informatiky, ale také směrem digitální kompetence. V tomto školním roce běží na 20 pražských školách pilotní vzdělávací program, díky němuž materiály ověřujeme. Přihlášky do tohoto programu jsou uzavřeny.

https://aidetem.cz

vlada.cz

vlada.cz

Umělá inteligence slibuje lepší zítřky, ne vždy je ale vše ideální

Hájková

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Conceptualizing AI literacy: An exploratory review

Author links open overlay panelDavy Tsz KitNgaPersonEnvelopeJac Ka LokLeungbEnvelopeSamuel Kai WahChuaEnvelopeMaggie ShenQiaoaEnvelope et al.

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Umělá inteligence

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Unit 4: Teaching framework for soft skills training

On completion of Unit 4, the participants should be able to:

- Know what soft skills are and why they are important.
- Know the important soft skills needed to work with AI.
- Understand the teaching methods that bring soft skills closer to the learner.

4.1 Introduction

Citation

"AI is probably the best or worst thing that can happen to humanity."
(Stephen Hawking, British physicist, 1942 - 2018)

There are already self-driving rail vehicles that nevertheless take passengers safely from A to B. Autonomous cars are still in final development, but soon they will be able to be controlled remotely. Autonomous devices make decisions according to defined rules based on mathematical values. Predefined algorithms enable the use of autonomous systems wherever measurable decisions can be programmed. What they lack is feeling, motivation or creativity, and they can only make the decisions that have been memorised for them.

The objectives of this unit are to learn about the limitations of artificial intelligence and why soft skills have become so important in working with machines. Subsequently, you will learn how to teach soft skills, how to enhance them and receive instructions for exercises to promote the learners' teamwork and creativity.

4.2 Soft skills and their importance

The lack of emotions, and thus emotional intelligence, thus defines the limit of the possibility of using autonomous systems.

Citation

"Machines can learn the meaning of words, but they cannot feel that meaning. Loving, feeling left out, winning, losing - these things mean something to us because we are social beings. We share feelings with monkeys and other animals. But not with computers."
(Joanna Bryson, computer scientist at the University of Bath)

Conscientiousness, empathy, direct communication or negotiating skills are human soft skills that machines cannot learn. The human brain is still considered the super machine that is far superior to artificial intelligence, especially wherever emotions are required. A person's emotional state is reflected in their facial expressions, gestures, posture and voice.

Because machines have already taken over many jobs and will be used much more often in the future, the emotional competence of humans is becoming increasingly important.

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An international study in 11 countries surveyed 2000 employees and managers from six industries. The findings revealed that human qualities are among the most important success factors in the digital age.

Long gone are the days when hard skills, i.e. measurable technical competences such as machine knowledge, foreign languages or PC skills, were sufficient to be successful in a job. Soft skills are personal, social competences that are important in everyday working life, because they are often decisive in determining whether a person is assessed as a good or great team member.

Let's take a closer look at the most important competences:

- **Optimism**, is an attitude towards life that means respecting oneself and being positive towards oneself and others. Optimistic people overcome challenges and achieve goals, they can adapt better in difficult situations and recover more quickly from setbacks.
- **Conscientiousness**, is the expression of careful, considered action, respect for the lives and property of others, righteousness, loyalty and integrity. It also includes a love of order, a sense of duty and self-discipline.
- **Motivation**, a skill that enables us to work purposefully, to overcome difficult situations, to work hard and to compromise in order to achieve goals and dreams.
- **Empathy**, is that gift to put oneself in the shoes of others, to read their feelings, to develop understanding for their behaviour and to accept it.
- The **ability to deal with conflict** helps to accept different opinions, to develop solution strategies and to apply them.
- **Stress resistance** means dealing positively with conflicts or stressful situations. The ability to act calmly and disciplined in such moments and to counteract them positively.
- **Active listening** to what others have to say means taking in the other person's opinion actively and with interest, listening and accepting their argumentation without committing or deflecting.
- **Creativity** is the competence to create something new, be it thinking of new solutions, finding new perspectives, creating more effective methods. It helps us to leave old (thinking) paths and to face new challenges.
- **Communication skills** are among the most important qualities people possess. Interaction and collaboration thrive on communication, whether oral, written, face-to-face or via e-media. Good communication involves listening, talking, asking, giving feedback, body language, honesty and clarity.
- **Hands-on mentality** is the attitude to do something actively and independently without having to be asked to do it. This quality is indispensable in teamwork. Only those who lend a hand can participate in the success of innovations.
- **Flexibility and adaptability** are indispensable in this fast-moving age. Only those who can adapt to new situations, new colleagues, new working conditions will make progress.
- **Analytical thinking** means having the ability to gather information and use it appropriately to solve complex problems independently.
- The ability to **work in a team** is required in order to be able to cooperate successfully with others, because nowadays more and more tasks are being carried out by several people.

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Citation

"Fifty per cent of the economy is psychology. Business is an event of people, not computers. That's why moods, mental states, psychology plays an extraordinary role." (Alfred Herrhausen, former spokesman of Deutsche Bank)

THE social behaviour or THE ultimate collaborative person does not exist! It is always a combination of professional expertise paired with competent social behaviour, but always context-dependent. Different situations require different behaviour.

To get any insight at all into your competences, now is the time for your self-assessment:

What are you good at, what distinguishes you from others? This is not about your professional competences, but rather about your way of approaching others, whether you are able to assert yourself well, whether you can perhaps also take a hard line once in a while, etc.

Which 5 character traits are your best?

1. .....
2. .....
3. .....
4. .....
5. .....

Now we come to a somewhat more difficult task. Write down your five weaknesses here. Look at yourself through the eyes of another person. What would they say about you?

1. .....
2. .....
3. .....
4. .....
5. .....

Self-awareness can be trained, educated and improved. It can be an exhausting process at first, but the journey is worth it. With the help of this analysis, it can be determined where you may still need training, which competences are not yet mature, where you would like to become even better.

What are the possibilities for training your self-awareness? Here are a few examples:

- **Keep a diary.** Name feelings in certain situations, your satisfaction with your behaviour, your feeling after this situation and the reaction of others to it should be brought before your mind's eye once again.
- **Practise relaxation techniques:** Information overload through digital media and permanent accessibility make people ill in the long run and even change some brain structures. To counteract this stress, relaxation techniques such as Qi Gong, autogenic training, yoga or progressive muscle relaxation according to Jacobsen are a good idea.
- **Look at yourself with distance:** Imagine you are sitting in the cinema watching a film about yourself. The task is to see yourself through the eyes of a film camera. A further step could be that you actually film yourself. Often, how we see ourselves is very different from how we appear to others. This reveals that you may often and

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completely unconsciously wipe your nose, constantly wiggle your elbows, speak much too quickly, etc.

- **Exercise and pamper yourself!** Happiness messengers are emitted by our brain when we treat ourselves to something nice or exercise. At least 30 minutes of exercise per day strengthens your immune system, gives you a trained body and gives you time to listen to yourself and think in peace.

Once you are aware of your strengths and weaknesses, the next step is to choose the appropriate training measure, because soft skills can always be learned or improved. Self-learning courses, group seminars, weekend measures or personal coaching are all available for this purpose.

Let's now look at how humans and machines can work hand in hand. How do soft skills and artificial intelligence complement each other?

Garry Kasparov, Russian. World Chess Champion, suffered his defeat against the IBM chess computer "Deep Blue" in 1997. As a result, he organised tournaments in which humans competed against this machine and against the human-computer combination. The discovery was that mixed teams of human and artificial intelligence were more successful than computers alone.

Nevertheless, there are already robots today that are superior to human intelligence. For example, an artificial intelligence from China that detected a brain tumour faster and more accurately than a team of experienced doctors could.

But would this machine also manage to inform the affected patients about this diagnosis in a sensitive, empathetic and respectful way? No, because this is precisely where the emotional intelligence of the human being sets the limit for the machine.

The use of artificial intelligence for demanding tasks is on the rise and is changing business models and the world of work. The democratisation of autonomous activities through AI creates time for curiosity, creativity and innovation among employees.

AI as a supporter for analyses, product development, troubleshooting, translations, as a personal language assistant or surgical robot for minimally invasive operations, provides precise services that are designed and programmed by humans. These machines are neutral and serve as relief to humanity in the form of non-human assistants.

What makes humans unique are values, feelings, willingness to learn, desires and needs - social characteristics that machines cannot learn. Therefore, it will be of great importance in the future to use the combination of man and machine as a guarantee for success.

Citation

"Human-machine interaction will increase very significantly in importance for practical application and implementation in companies in the coming years."
(Andreas Moring, Prof. for Digital Business at the International School of Management)

4.3 Important soft skills related to AI activities

Let's now look at what are the most important skills to be able to work hand in hand with artificial intelligence.

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A great advantage of humans over machines is the gift of being able to think critically. Nowadays, it is no longer about accumulating a lot of knowledge, but rather about being able to critically question information. It is not the person who can process a lot of knowledge at once who becomes successful, but rather those people who can overview, analyse and categorise accumulated knowledge.

Let's take the example of "Wikipedia" - a knowledge platform that is, however, considered an unreliable source. Wikipedia can be changed, supplemented or shortened by all users, without any guarantee of accuracy.

The same aspect is offered by newspapers and television stations. They too do not report completely independently, but from the point of view of your truth. And THE ONE TRUTH rarely exists.

So in the end, it's about considering different perspectives to form your own opinion from the multitude of information.

Another aspect of **critical thinking** is the manipulative suggestions of the apps we use. Here we distinguish - according to the French researcher Camille Roth - between "read our mind" and "change our mind" functions.

"Read our mind" stands for algorithms such as those used by Netflix, Linkedin or social media, which analyse our user behaviour and make suggestions for films, contacts or products.

However, if algorithms suggest new products to us in order to increase the company's sales, if our Lieferando app shows us that we only have to add 1 dish to get a 10% discount, then we are talking about "changing our mind".

The same applies when our robotic mower is already mowing the 3rd round in the same spot, but the rest of the garden is still undone.

This is exactly where the critical thinking of humans comes in, because now it would be time to switch on the head and question the proposals of artificial intelligence. In professional life, complex issues are becoming part of everyday life. In order not to have to make all decisions at the top of the company, the trend is towards flat hierarchies and more and more responsibility is being transferred to critical team members who think for themselves.

> **Note**
>
> Critical thinking means forming your own judgement and not simply adopting what others think is right.

Let us now look at four exercises that can promote critical thinking:

1. **Question your decisions - for one day**
   Why do you have a subscription to one daily newspaper? Because it was offered to you at a reasonable price, or because you are convinced that this information sheet reports independently? Why do you order the 3rd winter jacket in blue? Because you received a -30% voucher from Zalando, or because the other two jackets no longer fit you? Why are you cooking cauliflower today? Because it was on sale, or because you have been a vegetarian for a long time?
   At the end of the day, question all your decisions and look at them with a critical eye.
2. **Start looking for answers**

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When you read a book, start by reading the title and wondering what you can expect in that chapter. Question this information critically and link it to the knowledge you already have. Your interest in new things and the basis of basic knowledge provide you with the right questions with which you suddenly process the book as an active user instead of a passive reader.

3. **Allow questions from others**
   Let's go back in world history about 2 years, to the beginning of the Corona crisis and the worldwide standstill. Society was divided into vaccination supporters and vaccination opponents, there was nothing in between. There were demonstrations, various conspiracy theories were proclaimed, and everyone thought there was only their truth.
   Very few of us allowed ourselves to listen to the arguments of the other party and to critically examine them. Leaving one's own think tank would have been so important in order to get a general picture of the situation and to get through this difficult time with reason.
   Today, too, try to respect the opinion of others, to have their decisions explained to you, or simply to read something that you are completely critical of.
   Why? Because children also explore the world through this question word and have our truth explained to them.
4. **Questions for critical thinkers**
   The next time you are confronted with a proposal from others, the following questions might help you:
   1. What is the argument in favour?
   2. Who does it serve?
   3. Why do we need it?
   4. Who does it harm?
   5. Is there an alternative?
   6. What argument is there against this?
   7. Who could be against it and why?
   8. Can we achieve the same result more cheaply?
   9. Which steps in the process can we omit?
   10. Why does this problem exist?

Allow and always remember critical thinking in all situations:

Important

"Our head is round so that thinking can change direction."
(Francis Picabia, Cuban writer, painter and graphic artist (1879-1953)

Another advantage of humans over artificial intelligence is the **ability to solve problems** independently.

How is this property defined?

- Problems can be identified, viewed from different perspectives and described
- Solutions are found, even if the solution path seems diffuse, failure is dealt with constructively
- If a task becomes complex, you still keep at it
- Information and tools that are available are put to effective use
- Solution strategies are developed independently and motivated
- Clear communication about ideas and approaches

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- other persons or groups of persons are involved in problem solving

All these approaches can only be adopted by artificial intelligence to the extent that they are pre-programmed. If an unexpected complex problem arises, human intelligence, the so-called human resource, is needed to search for and find solutions through active intervention and innovative approaches. Experience and knowledge expanded through learning processes, coupled with the ability to share ideas in a team, represent a clear advantage over machines.

How do you test problem-solving skills? Through simple case studies in the course of an interview. Examples could be:

- Tell us about your biggest failure. What went wrong?
- How did you carry out the error analysis in the team, how was the error rectified?
- How has the team developed since then, what knowledge has been gained from the mistake?

Extensive examples of personality tests on the topic of problem-solving skills can be found at www.personal-point.de/personalauswahl/tests-und-frageboegen/#bip.

You now already know the definition of critical thinking and problem-solving skills and how to acquire, apply and promote them.

Another superiority of humans over machines is decision-making.

Already in the 16th century, Ignatius of Loyola, co-founder of the Jesuit order, developed a way to find the right answer for every decision within a week.

To this end, he advised his fellow believers to pretend for three days that they had already made their decision. They were to pay attention to their emotions, thoughts and dreams and write them down. On the fourth day of the week, the hypothetical decision was discarded, and the process was repeated again, again recording feelings, thoughts and inspirations. At the end of the week, the handwritten notes were laid side by side and alternatives and solutions were sought with a cool head. Only then was a decision allowed to be made.

The solution can be represented graphically as follows:

There are seven methods of decision-making in the modern world, all based on scientific evidence.

- **Research:** means looking at the decision from different angles in order to trick ourselves with the help of further information. Because the human brain tends to reward, which makes it difficult for new, possibly different information to convince us.
- **Narrow down your choice:** Imagine that you are offered samples at a trade fair. At stand A you can choose from 5 types of chocolate, at stand B you are offered the same, but you can choose from 15 types. You will realise that with the larger offer you will find it more difficult to make a decision and may be overwhelmed.

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If you want to know everything about everything, it will be difficult to reach a decision, especially if you do your research on the internet. Therefore, limit your sources of information, quality is more important than quantity.

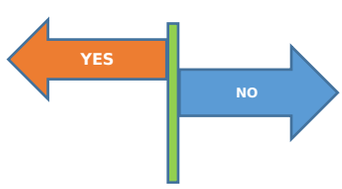
- **Good is sufficient!** If you compare 10 types of bread instead of 3, and even then revise your decision, you may end up with a worse product than originally planned. The same applies to users of dating platforms. Those who are looking for THE IDEAL life person will remain alone due to endless demands instead of living in a happy relationship.
- **No fear of consequences!** Experienced decision-makers know that in critical situations one does not decide immediately, but consults other people. We automatically weigh up whether our decision can bring us a profit or a loss. If the risk of loss outweighs the benefit, we are very likely to decide in favour of the risk-free option.
- **Trust your gut feeling!** "In extreme sports, if you are not sure if the conditions are good enough for you to survive the day, the conditions are not good enough," said Tom Manings, one of the first parachute instructors worldwide. The basic prerequisite for gut decisions is sufficient knowledge and a good feel for the subject matter.

  Decisions made under extreme conditions, such as fear, infatuation, anger, etc., can often be wrong and are regretted afterwards.

- **No choice is a good choice!** In the 90s of the last century, the following mantra applied in managerial circles: "Make sure that good decisions are attributed to you, bad ones to your opponent". In the age of flat hierarchies and teamwork, it is common to discuss problems, listen to other opinions and often make the decision not to choose, i.e. not to commit.

  Let's take the example of a personnel decision. The position of the new sales manager was advertised, numerous applications were sifted through, two candidates remained after 3 hearings. Both bring a lot of experience, the competences are comparable, but both candidates are not optimal team leaders. Before deciding on one of the two candidates, the team decided to temporarily fill the position internally and, if necessary, to re-advertise at a later date.

- **Decisions are decisions.** Even if we live forward and realise backward, decisions are often fraught with uncertainty and sometimes cannot be reversed. Therefore, even if you realise that the decision was wrong, you should not expend further energy. Focus your energy on new decisions and let the old one rest.



Citation

"The shortest words, namely "yes" and "no", require the most thought."
Pythagoras of Samos (Greek philosopher, 570 - 510 BC)

In addition to all these cognitive and emotional abilities, humans also have **creativity**, which machines cannot possess to the same extent. Artificial intelligence can already compose music today, but only from existing, stored pieces of music that are remixed in the background.

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But what is creativity? It comes from rethinking the old. The basis of all these innovations is always lateral thinking, which creates something new by pursuing crazy ideas and breaking out of old thought patterns. This requires combining existing knowledge from experience with new things, and allowing new relationships to develop from different information. Through this gift, humans will always have the upper hand over machines.

A typical example is the Velcro fastener. The tiny hairs of burdock - a plant species you may know from your walks, and which likes to get caught in the dog's fur or your socks - inspired the Swiss engineer Georges de Mestral to invent Velcro.

The QR code, which the Toyota company developed to identify its production components, is now used in merchandise management, for cinema tickets, job advertisements and even on business cards.

The lotus effect ensures that water and dirt particles simply roll off due to the special structure of the plant. You probably know this from the car wash or from dirt-repellent textiles.

Similar to the previous topic, there are also some impulses in the area of creativity that help to bring it to light and to change one's perspective. You will learn more about this in the next chapter.

4.4 Methods for teaching soft skills to young people

On the following pages you will find a handful of exercises to help build and strengthen the emotional competence of young people. In addition, you will get an insight into how to promote teamwork and how to boost the creativity of your youth audience.

At the beginning of each training unit there is a needs analysis to determine what content is to be taught. This is followed by the selection and content of the training measure. Activities that focus on the personality of the participants are especially suitable for young people. These can take the form of behavioural training as well as outdoor activities or coaching.

At the end of each measure there should be an evaluation to determine whether the training has brought the desired success, what was particularly well received and what deficits still exist.

The basis of personality development is self-knowledge, self-acceptance and the will to change. The idea of becoming the best version of oneself and exploiting one's own possibilities to the full.

Online questionnaires can be used for introduction and self-reflection. As an example, we mention the one that you can access at https://de.surveymonkey.com/r/BB5JVHN.

The promotion of emotional intelligence can be divided into three categories:

	Life skills training for young people	
Personal competence	Concerns dealing with oneself, so-called self-management. Corresponding soft skills are motivation, the ability to learn and perseverance, resilience and independence.	Weekly work such as presentation, lecture, research, "hard nut" tasks for volunteers, coaching talks after failures
Social competence	Refers to dealing with others. It	Partner and team work,

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	presents itself in the form of empathy, knowledge of human nature, communication and cooperation skills.	discussions, mutual mentoring
Methodical competence	Concerns learning and mastering methods and techniques, such as presenting one's own work, dealing with media, working efficiently and problem-solving skills.	Use of digital media, creating presentations, presenting own approaches to solutions

The following methods are suitable for teaching soft skills:

- **Group work (incl. group puzzle)**
  Young people are given the task to coordinate a common work, to exchange their knowledge and to work out a common solution. The basis for this is that all persons involved take responsibility for the result and share their knowledge in the group.
  An extended form of this is the group puzzle, in which a framework topic is divided into as many sub-topics as possible. Each topic is worked on by a randomly created group, making them experts on the topic. Subsequently, the young people are divided into new groups so that in the newly formed groups each member brings a certain expertise with him/her and shares the knowledge with the others.
- **Casework**
  This form of individual work is suitable for learning new content, deepening an already known area of learning, presenting professional practice or preparing for a profession. It promotes independence and initiative, self-control and teaches to take responsibility for one's own actions.
- **Feedback**
  Represents feedback on (learning) behaviour, performance, attitudes and presentation that informs further behaviour. It does not only show praise and criticism, but rather behavioural alternatives and thus supports to expand or improve one's own behavioural repertoire.

  Feedback promotes self-awareness, reflection, self-control, and respect and acceptance of other opinions. Both those who obtain feedback and those who give feedback expand their communication style and empathy through this exercise.

- **Reflection**
  Looking back at one's own behaviour or processes is an essential contribution to personal development. Only the examination of what has been said and done, and the drawing of consequences from it, helps to optimise future processes.

  Self-confidence is strengthened, the willingness to make decisions is increased and the responsibility for one's own actions is strengthened. In addition, this exercise promotes the ability to act according to the situation, gives role security and teaches how to deal with mishaps. Mistakes should not be seen as negative, but as a learning opportunity.
- **Role plays**

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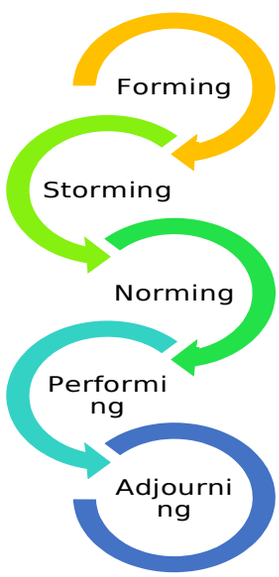
This form of exercise allows young people to experience their own and others' experiences and behaviour through talking and playing. They are used to illustrate a life situation, to present problems and conflicts and to try out new ways of behaving.

Self-confidence is strengthened, the willingness to make decisions is challenged, the linguistic component, as well as respect and acceptance come to the fore, and the ability to perform according to the situation is trained.

In addition to the exercises already described, we would like to give you some tips on how you can specifically promote teamwork and creativity among the young people:

A team that is well attuned to each other is able to master difficult tasks with flying colours. Good teamwork not only promotes enjoyment of the work, but also the intellectual and professional output of the people involved.

Teamwork can be developed in five phases:



In the **forming phase**, the team is formed, people get to know each other and get to know each other. This phase is characterised by cautious feeling out. The team's performance is low but increasing.

The **storming phase** is often marked by conflict. Those who find each other sympathetic form a group and face the others. This enormously important phase is about power relations, priorities and goal setting. The performance of the team decreases significantly.

In the **norming phase**, the team slowly moves into everyday life, rules for working together are worked out, a common goal emerges. The feeling of togetherness increases, everyone wants to play their part and knows what their task is. The performance picks up speed.

The **performing phase** is also called the performance phase. The team is well-rehearsed, works together effectively, they know each other well and know how to deal with each other. The team performance is more than the sum of the individual members. It levels off at a high level.

The **adjourning phase** means the end of a team, it is dissolved. This point in time can lead to a drop in leadership even before the actual end. For some members it is not clear what will happen next, they start to worry and become very distracted by it. Performance decreases enormously.

Citation

"Coming together is a beginning, staying together is progress, working together is success." Henry Ford, US-American. Inventor and automobile pioneer (1863 - 1947)

Here are exercises for the individual phases:

Phase 1 - Group identification:

Speed dating: 2 participants each have 2 minutes preparation time to get to know and present each other.

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Phase 2 - Conflict phase:

Ball throwing chain: All the young people stand in a circle. The teacher calls out the name of a young person and throws the ball to him/her. The young person calls out another name and passes the ball to the corresponding person. This continues until everyone has received and thrown the ball once. This creates an order that has to be followed in the second round, but a second ball comes into play. The aim of the exercise is to consolidate the names of the individual team members.

Phase 3 - Regulatory phase:

Leading blindly: A special outdoor training: The group is divided into pairs, one of whom is blindfolded. The person with sight now leads the "blind" person across the terrain. Different surfaces and hurdles should be overcome.

The circle members are responsible for gently pushing the falling person back to the standing position.

Phase 4 - Growth phase:

Count through: All members stand behind each other, the person in front starts counting, all other members count through until the number of people present is reached. Collusion is not allowed. If there is a mistake, the counting starts again from the beginning.

An increase in difficulty is when you start counting in the middle of the group.

Phase 5 - Dissolution Phase:

When a project is successfully completed, it is a good idea to reward the team. Examples of this could be: a joint excursion, a joint visit to a cultural event, cooking and eating together. It is important that the focus is on fun and that the day can be spent free of pressure to perform.

Some of the exercises explained can also be used to promote creativity. Others for this are:

Sign and write with the other hand: Challenge your brain by drawing a picture or writing a word with the other hand. Try it also mirror-inverted, or with one pen per hand.

5 words, one text: Pick any five words (e.g. from a dictionary or a newspaper) and use them to write a text containing all the words in ten minutes.

There are no limits to your creativity. Let yourself be inspired by your everyday life, nature and everything you encounter in the course of the day.

4.5 Summary

This unit showed you why machines cannot learn emotional intelligence and what the limits of artificial intelligence are. You know how technical competence, soft skills and artificial intelligence complement each other and have learned how to promote and expand this increasingly important skill.

You can define critical thinking, problem-solving, decision-making and creativity, explain why these tasks are done by people and not machines. You know methods to build and develop these skills.

Exercises to strengthen soft skills, teamwork and creativity will give you a good start in your work with young people. We wish you much success!

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Unit 5: Case studies to be used in teaching AI. Real-time case studies to be integrated into the teaching process in teaching skills.

5.1 Introduction

This unit aims to teach the learners how to use AI applications in different ways in their own classrooms by presenting some examples of applications that can be used to make lessons more efficient with the development of technology and the use of artificial intelligence in different educational applications. It contains five parts that includes various of examples of using AI in real life. First part is smart tutoring systems and personalized learning which provides us information about real Life educational applications of AI and AI use in translation. The second part focuses on use of AI tools to make studying easier especially for students who need special education but also use of AI tools when studying and developing content. The third part gives examples of kids making AI to encourage readers about machine learning. The next part is more focused on classroom use of AI and how to optimize classrooms for learning outcomes with AI. The last part is focused on the international case studies to motivate students.

Objectives:

- To demonstrate a few of artificial intelligence applications that can be used to increase the effectiveness of lessons.
- To teach the learners how to use AI applications in their own classrooms in various ways.
- To provide a variety of examples of how AI is used in practical situations.
- Raising awareness on intelligent tutoring platforms and individualized learning via AI.
- Raising awareness on AI use in education.

5.2 Smart tutoring systems and personalized learning

Real Life educational applications of AI

Artificial intelligence (AI) and machine learning are ever-evolving across all industries, including the education sector. In this chapter we are going to focus on different AI applications used in classrooms by presenting real life examples. AI is helping smart tutoring systems by using cognitive science and AI technologies, meaning they offer personalised service and real-time feedback for learners, like Carnegie Learning. This personalised electronic tutoring system leans on adaptive learning; Mastery Learning which integrates the curriculum around the students' progress, helping to support the effectiveness of individualised tutoring and classroom instruction. Moreover, it combines immediate opportunities for corrected practice, timely target feedback, and enrichment activities.

Also, it personalised learning through AI-powered apps by this way every student's individual needs get fulfilled such as letting students to work at their own pace and focus on the subjects they struggle with the most. From the perspective of teachers, AI-powered apps give them the opportunity to tailor lessons into individual learning styles so every student

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gets the finest assistance. Examination process can be stressful for a student but also for the teachers due to cheating and suspicious behaviour of their students during exams. There is an AI software that helps to address this problem, especially when students are online and in remote learning and proctors can't control them in person. The software keeps track of students' microphones, web browsers, and web cameras, and conducts a keystroke analysis. Facial recognition systems can even detect when students aren't staying in their place or if they're looking for information in their workbooks while in the exam. A hybrid of this approach can also improve the assessment process and deter cheating, with both AI tools and remote human proctors. The proctors receive data in real-time from the tools, being able to see suspicious behaviour and immediately correct it. AI Proctor can be given as an example, it offers a range of benefits and only needs a camera for zoom and no additional, special hardware.

Some of the features are; automatically closes the browser after an exam, sends detailed cheating videos to instructors, adds reminders to students five minutes and one minute before the exam ends, and offers a browser add-on that monitors activity.

Using AI for translation

The Translator for Education site provides free resources, tools, and how-to guides for live captioning and translation in the classroom. Schools are increasingly diverse. Teachers manage many types of learners, including students who are deaf or hard of hearing (DHH) who require assistive technology, and language learners (and their parents) who may not speak or understand the language of the classroom well. The third case study contains Azure Cognitive Services that has on their target the multilingual and diverse schools. AI is helping to make big strides in the availability of classrooms to all students, especially those who speak different languages or have either hearing or visual impairments. Azure Cognitive Services are empowering translation and speech recognition tools, helping students to read or hear in their native language so that they can learn wherever they are in the world. Microsoft Translator helps bridge these communication gaps, supporting accessible classroom learning with live captioning, cross-language understanding, and even multilingual casual conversations to help with student integration.

1. Teacher Applications of Microsoft Translator:

- Lectures & Presentations; Translator apps translate and captions live presentations and engage students who are non-native speakers, deaf or hard of hearing, dyslexic, or having trouble taking notes.
- Parent-Teacher Conferences; Engages parents and the school community by providing real-time language translation for parent-teacher conferences.
- Study Groups; Discuss group projects and work together across many languages for English Language Learners and deaf or hard-of-hearing students.
- Conversations; The Translator app's conversation feature helps teachers better communicate with students in class or for one-on-one conversations.

2. Student Applications of Microsoft Translator:

- Translator app can be used in school, on campus, for study groups, and other situations where captions and translations are needed. The app can be shared with friends to start a live conversation and break communication barriers.

Let's have a look at a case study of this app with the Multilingual Parent-Teacher Conference; it took place in Chinook Middle School. Bellevue, WA. Students from all over the world, the Bellevue School District is an incredibly diverse district. More than 80 languages are spoken in the district, with over 30% of students speaking a first language other than English. A diverse student body includes family members too, who may not share a language

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with teachers or school staff, making school enrolment, teacher-parent conferences, meetings, and conversations with school staff a challenge. The app brought a solution to the problems of the school and district; Chinook Middle School used Translator for PowerPoint paired with the Microsoft Translator app to caption and translate a live parent-teacher coffee. Faculty, staff, and parents were able to ask questions and engage with the overall community, and everyone was included in the conversation.

5.3 Use of AI Tools to Make Studying Easier

AI applications in special education

Nowadays special education has notably improved but from now on with the help of AI and machine learning can make a bigger difference, by offering extremely customized learning that considers every student's learning ability and speed. Especially for Autism which has a wide spectrum, and there's increased pressure for schools to have a facilitator that overcomes barriers and offers special education students the individual attention they need. Furthermore, schools can leverage AI tools to offer extra support to students with special needs, making learning a smoother experience for both special education teachers and students. An example for this use can be the award-winning application Otsimo which has several success stories in this field, using AI for its speech therapy application. This aligns filters after children complete exercises, with the filters being part of a reward mechanism. Machine learning helps with voice recognition so the app can understand what the children say and fill their progress bar.

Using AI tools when studying and developing content

E-learning has infused a 360-degree transformation in the education world with the pandemic. It has diminished the learning rules and transformed them into digital literacy. Earlier, it was beyond one's imagination to attend classes online from home. All thanks to e-learning, now such consideration is possible, and many students are even benefiting from this revolution when they are doing their homework's or studying for an exam. Interestingly, Artificial Intelligence is taking this already thriving online education phenomenon to an altogether different level. Students can now clear their subject-specific doubts by seeking answers from AI-based questions bots. Moreover, AI helps students and teachers to share interactive educational material among various groups via their smart devices. Enhanced AI tools to check the answer sheets for objective and subjective questions papers are in trend.

Several AI interfaces are coming handy in studying eco-friendly across multiple smart devices, hence making way for illustrative videos, audios online assistance programs and more. For instance:

- Cram 101, is an AI interface, that breaks down textbook content into a smart guide instead of printing a chapter from the book students/teachers prefer this tool.
- JustTheFacts101, another AI tool, creates and highlights chapter-specific summaries to include into a digital collection, students mostly use it to highlight specific part when studying.
- Netex Learning allows educators to create their own digital curriculum by including multimedia content (videos and audios) and online-instructor assessment on a personalized educational cloud platform.

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- Carnegie Learning, another smart tool, leverages the combination of AI and cognitive science to give personalized tuitions and real-time feedback for students from post-secondary schools.

5.4 Kids making AI

Integrating Machine Learning

The implementations of AI in education are to help support learning in the forms of intelligent tutoring systems, personalised environments for learning experiences, assistive tools for teachers in order to deliver high-quality education and more. Beyond applying AI as the tools for education, the process of learning to make AI is increasingly important as technology becomes the disruptive force to create changes and solve many problems in society. Given the complexity of AI for young students and the prior technical background knowledge required in order to understand AI. This case study focuses on an approach that tackles this challenge using gamification in teaching machine learning (ML), a type of AI that can learn from the given dataset to perform a specific task without being explicitly programmed, to young students in Thailand to learn the process of making AI with the real-world context that touches on the social issue in Thailand. Also, to extend the approach in the learning of AI they have used a social domain using real-world examples as the challenge for the students to solve. To encourage the students to learn to make AI requires innovative methods to translate complex concepts into understandable knowledge and hands-on activities. Researchers have applied “gamification”, the use of game elements in non-gaming systems which have demonstrated empirical evidence to improve learning outcomes, to teach AI to students.

The framework was based on 4 core values (Four P’s of Creative Learning) that foster students to become creative learners: 1) Projects: researchers found that students learn best when they are actively engaging on the projects that are meaningful to them. 2) Passion: the freedom to work on meaningful projects foster the students to invest in their works and persist in the face of challenges, which make them learn more in the process. 3) Peers: learning is a social activity, where fellow learners are constantly collaborating on ideas and sharing thoughts. 4) Play: learning involves playful experimentations, trying new things, tinkering with materials and tools, testing boundaries, taking risks, and iterating the projects again and again. The case studies challenge was to translate the complexity and technical knowledge of machine learning to 84 middle school students (grade 7 to 9) in 3 days. Therefore, the suitable system must be sought in order to allow the students to easily follow the sophisticated AI related technical details and have good experiences with their experiments.

The program RapidMiner was used as a software that allows the students to explore machine learning by dragging and dropping blocks to construct flowcharts of the machine learning process. To make the concept of machine learning accessible to students, they created games based on the machine learning classification problem, the challenge of using machine learning to classify objects into categories based on the prior training dataset. To fit the challenge with the theme of agriculture, they chose mango as their target. Mango is a local and popular fruit in Thailand. When it is unripe, it is sour, green, and crispy. When it is ripe, it is sweet, yellow, and chewy. Its physical appearance also changes from hard to soft during the ripening process. As a result, there are many features of mango to observe, which is crucial for building the machine learning dataset.

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As a result, the AI related tasks in the workshop, students combined knowledge, observations, and teamwork efforts to achieve the goal of using the machine learning model to predict the sweetness and quality of mangoes.

Based on the self-assessment questionnaires, students had more fun, engagement, and hands-on interactivity in the workshop compared to their regular classroom, even though the topic of AI is much more complex and challenging. This demonstrates that highly advanced concepts can be learned by students if the learning environment is well designed and organized.

5.5 Optimizing classrooms for learning outcomes with AI

Using AI for Classroom/Behavior Management

The next-generation of collaborative teaching with AI-driven assistance Classroom engagement “Sens”; harnesses the power of data to improve learning outcomes. Driven by advanced machine learning, Sens collects environmental and engagement metrics to optimize schools for the best possible learning outcomes one classroom at a time. Sens is designed to benefit the student and the teacher. By providing real-time data insights, teachers can develop strategies based on advanced insights of student response. In many cases, this can be used by teachers to receive important information about the emotional state of students at any given time. This then makes it possible for lessons to be adjusted in the moment so that teachers can meet students’ needs and maximize the overall quality of lessons. For instance, using a ViewSonic’s myViewBoard Sens makes it possible for teachers to receive real-time feedback about the behavior of students, such as participation and engagement levels. The AI-powered technology can also detect facial expressions — by safely creating an image that shows no features — or the posture and body language of students, and then interpret the mood within the classroom. As a result, at any given time, teachers can know the percentage of students in the classroom that appear to be happy, the percentage of students in the classroom that appear to be confused, and the percentage of students in the classroom who seem bored, or otherwise disinterested in the material that is being taught at that time. Moreover, detects student participation such as hand-raising, physical posture, and concentration levels. Ultimately, this allows teachers to make adjustments to lessons as they progress, so that engagement is optimum. This could mean, for example, moving from conventional teacher-to-student instruction to an active learning session, or taking the time to explain concepts in more detail to a confused classroom.

Ensuring the Classroom Offers Great Learning Conditions with Using AI

The right information at the right time to make a difference in learning outcomes, Insights from myViewBoard are all about making the most of education. Making use of the latest technology and pedagogies is essential. Leveraging advanced metrics improves learning outcomes and professional development. And compiling these factors gives your school a full picture of its learning spaces. While it is important for teachers to be able to understand the emotions, behavior, and engagement levels of students and respond accordingly, it is also essential for the classroom itself to serve as a great learning environment. In other words, the conditions need to be right for students who are receiving and, hopefully, retaining information. One of the most exciting ways in which AI in education can be deployed involves

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using the technology to actively monitor classroom conditions and then alert teachers to any problems or areas where improvement is possible.

Mostly, when teachers think about classroom conditions, they may immediately think about issues like the temperature in the room or the amount of light. After all, if a room is too warm or too cold, it can lead to discomfort, and this will then result in a classroom full of students who are distracted or less engaged. Similarly, light can be important for visibility, but research from the University of Mississippi also shows that light quality can fundamentally alter student performance. Both of these issues can potentially be resolved by AI, with systems learning the ideal room conditions and automatically making adjustments to heating, air conditioning, lights, and electronic blinds. However, software such as Insights can go a step further than this by continually analyzing other classroom conditions. This can include the occupancy rate of the room and the amount of personal space students have. These issues became especially important to monitor during the COVID-19 pandemic in order to minimize the virus' transmission potential.

Another application is the Sens, that helps to keep students healthy with positive learning environments by monitoring environment with ease, including classroom lightening, temperature, and humidity. Objective feedback on the best possible learning environment is almost impossible to get. How warm is too hot? How bright is the room? And do those factors actually affect learning outcomes? Sens collects a wide spectrum of environmental data to compare against student engagement and creates the best physical learning environment for the student to keep them safe ensuring health protocol compliance. Sens used classrooms are ground zero for sniffles around the world. Sens uses a science-backed algorithm to create an optimal environment to maintain student and teacher health and is a great tool for monitoring physical elements of the classroom that could negatively impact student learning such as high temperatures, over crowdedness, and airborne illnesses. Teaching observations are intrusive, but their insights are valuable. As a technological guide on the side, Sens uses an array of sensors to process data about the environment and students' emotional states to optimize engagement, avoid frustration, and improve the overall learning experience.

5.6 International Case Studies

First school in Romania using AI in the classroom

International School of Oradea starts using Artificial Intelligence (AI) tools in the teaching and learning process The first Romanian school has started using Century`s AI technology in the teaching and learning process to develop pupils' skills for becoming the responsible and caring leaders of tomorrow. The platform, Century uses artificial intelligence, neuroscience and learning science to create personalized educational pathways for students. By using Artificial Intelligence, the platform learns how each student is learning and is providing them with nuggets of knowledge either to fill in the gaps or to challenge them in learning more. The usage is really simple, students log onto the program and start with a diagnostic test. This test offers a baseline view of the topics that will be addressed in a particular subject. The system then recognizes the gaps in knowledge in each learner and recommends content (called "nuggets") to help them with the retention of knowledge. The teachers have access to all the data from the diagnostic tests and can tailor the curriculum to address the needs of the classroom.

Also, the students can go through the nuggets independently or with the teacher. This is a great aspect of the platform because it supports independent learning and parent-school-

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student collaboration. The platform allows teachers and parents to see how a student is progressing. The research conducted by Century is showing that using the system improves a student's understanding of a topic by 30%.

Furthermore, its benefits are multiple as for parents, teachers and students:

- From the side of students; accelerates learning by intelligent personalization which improves student engagement and understanding. Also, instantly identifies and plugs students' gaps in knowledge so it pinpoints and addresses misconceptions in the class. Lastly, creates a constantly adapting path with learning content tailored for each student
- From the perspective of teachers: it really reduces workload and saves teachers hours in marking, analysis and resource creation.
- Also, it targets the parents as well, by offering instant access to their child's performance board and it empowers them in supervising their child's individual learning process, transforming them into active partners of the school.

Chat GPT In the Classroom: A New Opportunity for Teachers

An AI-powered chatbot developed by OpenAI, based on the GPT (Generative Pretrained Transformer) language model that uses deep learning techniques to generate human-like responses to text inputs in a conversational manner.The main benefits of chat GPT in the classroom is its ability to assist with language learning. With its natural language processing capabilities, chat GPT can help students improve their grammar, vocabulary, and writing skills. Additionally, it can assist with translation, providing students with the opportunity to communicate with native speakers and better understand different cultures. Another benefit of chat GPT is its ability to provide personalized learning experiences. It has the ability to understand and respond to students' individual needs, chat GPT can provide personalized feedback and support, helping students to stay engaged and motivated. Furthermore, chat GPT can assist teachers with administrative tasks such as grading and providing feedback to students. This can free up more time for teachers to focus on planning engaging lessons and activities, as well as building relationships with their student. Dr. Chris Piech, a computer science professor at Stanford University, has adapted this technology to his class. Dr. Piech allows his students to use Chat GPT to generate ideas for their final projects and to help them with their research. Dr. Piech believes that chat GPT can be a valuable tool for students to generate ideas, and to help them research and write their papers, it can also help with providing them with feedback and assist in the editing process.

Gradescope

Gradescope is a platform designed to streamline the grading process, delivering benefits to both educators and students. Use of an AI-Powered Grading Tool that helps you seamlessly administer and grade all of assessments, whether online or in-class. They can save time grading and get a clear picture of how the students are doing.

The AI tech was shown to reduce the amount of time teachers spent on grading by 70% and a lot of universities and high schools haveembraced it.The platform operates by allowing students to upload their assignments, which are then sorted and grouped by Gradescope. Educators have access to per-question and per-rubric statistics, providing valuable insights into student performance. Also, he ease of applying a consistent grading scheme with detailed feedback is the most useful feature according to the feedbcks of teachers using it. Lastly, teachers find it impressing the convenience of setting up assignments for grading.

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Conversational AI in education

IBM Research and Rensselaer Polytechnic Institute (RPI) collaborated on a new approach to help students learn Mandarin. The Cognitive Immersive Room (CIR) was developed by the Cognitive and Immersive Systems Lab (CISL) and tested in a Chinese 1 class on RPI's campus in the late fall of 2017. The CIR combines cognitive, immersive technologies with game-playing elements to enable students to experience a cultural environment, practice daily tasks, and get help from intelligent agents. The Mandarin Project is an immersive gamification classroom environment that brings together state-of-the-art technologies such as speech-to-text, natural language understanding, and computer vision to enable immersion and natural multi-modal dialogue.

The goal is to combine cognitive, immersive technologies with game-playing elements to enable students to experience a cultural environment, practice daily tasks, and get help from intelligent agents. The Mandarin Project uses IBM Watson as a conversational agent to engage students while they learn the language. This approach involves IBM Watson speech recognition and natural language understanding technologies for English and Chinese. Students can work with virtual conversation partners to practice vocabulary and pronunciation without the pressures of a real-world setting. Many language learning researchers are working with virtual or augmented reality, but we are investigating human-scale, immersive, gaming environments where students can physically walk around without having to wear specialized equipment. This reflects a broader trend in human-computer interaction, as our engagement with information becomes increasingly immersive and our interactions with intelligent machines shift towards partnership.

School Scheduling during the Pandemic with Artificial Intelligence

Vertex Intelligence, a data science company, was contacted by one of Indiana's top school districts to provide assistance with their school scheduling dilemma. Vertex Intelligence's optimization models have been proven to save thousands of hours of trial and error while providing a statistically-sound basis for critical decision-making. The goal was to identify which strategies would minimize connectivity between students, and Vertex Intelligence developed a system to mine district-wide class schedules to create a highly-accurate reconstruction of probable extended close contact networks of teachers and students.

Additionally, Vertex Intelligence extended its network approach to look at the overlap in students between classes to identify which individual classes would contribute the most connectivity risk by bringing together students who would not otherwise be likely to share classes. The school district opted to implement the recommended extended block schedule alongside some remote learning courses, and inform parents of the new schedule sooner than many other districts.

Motivating Students to Learn AI Through Social Networking Sites

In Hong Kong, after-school activities have long been used to foster friendships and to allow students to pursue their interests in an informal setting. This case study reports on a three-phase action research process in which information technology teachers delivered after-school activities focused on artificial intelligence during the COVID-19 transition to remote learning. The first phase converted the existing face-to-face curriculum to asynchronous online modules, the second phase added gamified tasks, and the third phase added live synchronous online sessions. Using semi structured interviews, a motivational questionnaire,

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and lesson observations, this study describes how extracurricular activities were delivered online using social networking sites and how students perceived the new experience. The results suggest that, in order to deploy meaningful activities via social media, teachers need to build collaborative environments that facilitate social engagement among students. These findings have implications for new practices in social media and other blended technologies, and can help students strike a healthy balance between their academic and non-academic life during this challenging period.

5.7 Summary

To sum up, the unit focuses on getting to know the possibilities of AI applications for various educational purposes by providing real life experiences of case studies. First chapter gives real life examples of AI use in the education system especially Smart tutoring systems and personalised learning. The next unit focuses mainly AI use in translation, how can AI provide an advanced communication and relations between diverse and multicultural people. The third case study is about getting familiar with artificial intelligence applications in special education. Following study's main goal was to come up with an innovative education model that fosters the students to connect the emerging technological solutions such as AI with the pressing real-world problems in the playful environment. As we look to the international case studies, the first school in Romania using AI in the classroom is an encouraging example both for teachers and students with AI providing instant identification for students' gaps in knowledge, highlighting points and addressing misconceptions, by this it creates a constantly adapting path with learning content tailored for each student. Afterwards, the case study shows that a data science company, was able to help one of Indiana's top school districts develop a school schedule in response to the pandemic. Another case study reports after-school activities focused on artificial intelligence during the COVID-19 transition to remote learning. Lastly, the Mandarin Project combines cognitive, immersive technologies with game-playing elements to enable students to experience a cultural environment, practice daily tasks, and get help from intelligent agents.To conclude from the case studies AI has integrated to teachers and students life and it seems like it will bring permanent changes to education.

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Unit 6: Information on how to inform the public about AI and ongoing process, state of art AI building activities, inauguration.

6.1 Introduction

This unit aims to provide information on how to inform the public about AI and ongoing process, state of art AI building activities, inauguration to the readers. It contains four parts that includes various of tips of familiarizing AI. First part is embracing AI in real life that makes an entrance with how to introduce AI in a fun way and how to build a trust relationship with AI. The second part focuses on the Impact of AI on Public Relations providing guidelines for the staff training in PR. The last part is AI in Media and Society provides information about the education of public about AI and concluding with Artificial Intelligences impacting in people's daily lives with also mentioning AI's role in education transformation.

Objectives:

- To provide information on how to educate the public about artificial intelligence (AI)
- To givefamiliarization recommendations for AI.
- Raising awareness to the impact of AI on Public Relations (PR), providing guidelines for the staff training in PR.
- Raising awarenessabout the importance of AI in education system's transformation.
- To identify the effect of AI on media and society

6.2 Embracing AI in real life

Introducing AI in a fun way

AI is changing the world radically, impacting societies, organizations, work, and education.AI is part of fundamental global changes and its power is increasing. It has already been implemented in education and schools in different forms, such as teaching robots, intelligent tutoring systems (ITS), online learning, and learning analytics. Lately, AI has been extensively adopted and used in administration, instruction, and learning. AI applications such as reviewing and grading students' assignments were seen as very useful and, in some cases, even more, accurate than human-based assessments. AI could help them improve instruction with more knowledge about students' learning and with interactive tools for learners' knowledge construction and sharing.

New technological systems have leveraged machine learning and adaptability, and curriculum and contents can be customized and personalized in line with students' needs. AI-related themes, such as teaching robots and web-based chatbots, have become common over the past several years. However, not all students are aware that they are using AI indirectly in their daily lives.

To address that acknowledgment by wisdom to awareness many schools have developed strategies. Some of these strategies are;

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- Introducing Artificial intelligence to children and the best way to explain to students is by making it fun by using amazing videos that you can easily find on Youtube. A fun movie that is equal parts engaging while it is learning.
- Another way to show some really fun examples of AI is Google's Experiments with AI collection. Some FREE projects can be used to showcase to students how AI can work.
- Real-Life AI Projects are becoming a trend in high schools lately, it is used in various class homework to involve AI in the classroom. For further information you can read the article ; Howtointroduce AI tothestudents AND makeitfun? | byShihabsultan | Medium

Recent AI technologies provide several options for learning and educational services. These include;

- Natural language processing (NLP),
- Speech recognition,
- Image recognition and processing, t
- Text analysis,
- Image manipulation,
- Autonomous agents,
- Affect detection,
- Predictive learning diagnoses,
- Progress forecasting,
- Socio-emotional well-being analysis,
- Financial predictions and fraud detection.

Artificial creativity uses AI to create new kinds and examples of photographs, music, artwork, or stories. AI has taken big steps in education and learning with a new method of computing and advanced technology for using and integrating multimodal data.

Trust in AI

Artificial Intelligence (AI) is influencing almost all areas of human life. Even though these AI-based systems frequently provide state-of-the-art performance, humans still hesitate to develop, deploy, and use AI systems. The main reason for this is the lack of trust in AI systems caused by the deficiency of transparency of existing AI systems. AI is an area of science that is likely to have profound social impacts and raise complex questions that cannot be answered by scientists alone. The public distrust of AI originates from the lack of a regulatory ecosystem that would guarantee the trustworthiness of the AIs that pervade society. Drawing from structuration theory and literature on institutional trust, it offers a model of public trust in AI that differs from models driving Trusted AI efforts. It emphasizes the pivotal role of externally auditable AI documentation within this model and the work to be done to ensure it is effective and outlines several actions that would promote public trust. It also argues that being accountable to the public in ways that earn their trust is what will ultimately make AI trustworthy enough to be woven into the fabric of our society.

"Trustworthy AI" is a research area merged intending to define guidelines and frameworks to improve user trust in AI systems, allowing humans to use them without fear. Some newspapers provide a survey on concepts of trustworthy AI and present trustworthy AI development guidelines to enhance the interactions between AI systems and humans during the AI system life cycle. In the case you need more tips about the "Trustworthy AI" you can

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have a look;Trustworthy AI Development Guidelines for Human System Interaction | IEEE Conference Publication | IEEE Xplore

6.3 The Impact of AI on Public Relations

AI in Public Relations

Public Relations and other communication approaches are using AI to transform the industry. AI can utilize its branches to provide efficient and effective campaigns for Public Relations, especially, since it was used during the pandemic. AI has become a part of our daily lives and offers businesses extraordinary capabilities to increase revenue and reduce costs. To understand the impact of AI in the field of Public Relations, people must learn more about the concept of PR.

AI solutions are becoming increasingly popular for Public Relations professionals, allowing them to create data-driven campaigns, automate tasks, analyse conversations, predict crises, and produce content. In 2018, the Chartered Institute of Public Relations (CIPR) identified the #AIinPR panel to understand the impact of AI on Public Relations. Although artificial intelligence offers benefits to PR, with the potential of removing some of the timelier processes, creative thinking and messaging are aspects that would fundamentally need human input.However, this needs to be highlighted by staff training that AI is not replacing but improving human work.

Public Relations firms can benefit from using AI to analyse volumes of information and monitor media coverage of competitive products and clients' competitors. AI helps firms with an in-depth search through all of the volumes and varieties of information, assess digital platforms swiftly, and identify relevant content. AI bots track media impressions of clients and competitors and determine relevant information based on audience interactions. New uses are being discovered and developed as the technology continues to grow.

AI is a tool and solution that the Public Relation industry is embracing, as it provides human touch, face-to-face client interactions, networking, and insights. It also provides efficiency in collecting data to help employees focus on client strategies and creative aspects of the industry. AI will help with repetitive tasks of Public Relations businesses by aligning software that collects specific data, contact information, and other measurable metrics. AI systems are trained to analyse, organize, and assess large data sets, and help develop new campaigns based on real-world data. AI also helps create campaigns that align well with the interests and agendas of the target audience. AI technology enables PR teams to divert their energy towards creative and innovative techniques, boosting efficiency and improving the speed of work.Learnmoreaboutthe Impact of AI on Public Relations (hitechnectar.com)

Guidelines for the staff training in PR are;

- LEARN about AI data
- DEFINE the PR and AI pitfalls
- IDENTIFY ethical issues and PR principles
- USE decision-making tree
- DECIDE ethically

(PDF) Ethics Guide toArtificialIntelligence in PR (researchgate.net)

AI can help public relations agencies filter through the enormous amount of data they must filter through. By programming a bot to look for specific terms or phrases, businesses can

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quickly comb through all the information available on any digital platform and pull out any material that is pertinent to their clients. AI bots can also be used to monitor media coverage of competing products and customers' rivals, scan news articles for mentions of their clients, and track any trends in those mentions. AI can also determine the best time of day for press releases, social media posts, and other avenues of engagement with their target audience, providing PR professionals with tips on how to create their content, which channels to use to spread their message, and even what kinds of content to include.

To conclude, PR is still mostly done by people, which is a good thing because people can build relationships and give advice on how to use the real data collected by AI to get the best results for clients. AI can increase productivity at work by allowing public relations professionals to focus on creative ideas and decide what advice to give their clients. More individuals will become aware of AI's advantages as technology continues to improve the productivity of our working lives, so it is important to wisely use this type of technology to benefit companies and their employees. Artificial Intelligence In Public Relations - How AI Is Changing The PR Industry (marxcommunications.com)

6.4 AI in Media and Society

How to educate the public about AI

Two new items related to educating the general public about artificial intelligence are the A–Z of AI guide from the Oxford Internet Institute and Google, and the MIT news office's new cross-disciplinary research initiative to promote the understanding and use of AI across all segments of society. The A–Z guide consists of 26 short items, one for each letter of the alphabet: artificial intelligence, bias, climate, datasets, ethics, fakes, etc. The aim is to provide answers in a not-overwhelming way, for example, the neural networks piece tells us that neural nets "attempt to mimic the structure of the brain" but they "cannot 'think' like humans." However, AI design teams can assign each piece of a network to recognize one of many characteristics, and the layers determine on their own which features they are detecting. This is important because it contributes to the "black box" problem of machine learning systems.

”People need to be AI-literate to understand the responsible use of AI and create things with it at the individual, community, and societal levels.”—Cynthia Breazeal, MIT professor, director of Responsible AI for Social Empowerment and Education (RAISE)

RAISE is an initiative to promote understanding of AI in all walks of life. It has identified four strategic areas for research, education, and outreach: diversity and inclusion in AI, AI literacy in pre-K–12 education, AI workforce training, and AI-supported learning. Binary code is the foundational language of computers, and a particularly long sequence of 0's and 1's means "Hello" to a computer.

To achieve AI literacy, there is a need to teach and explain to students at all levels;

- What computers can and cannot do,
- How they are programmed,
- How AI is different from writing a game program that plays tic-tac-toe, as well as any human, can.

RAISE (and other outreach programs) can help raise the level of computer literacy, as it will be easier for people to be duped, exploited, mistreated, side-lined, marginalized, and/or denied jobs, loans, mortgages, healthcare, or admission to universities if they don't understand what AI is and how it works. public – AI in Media andSociety (macloo.com)

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Artificial Intelligence Is Impacting Our Everyday Lives

AI is used in many areas of our lives, such as social media, digital assistants, self-driving and parking vehicles, email communications, web searching, stores and services, and offline experiences. Artificial intelligence is revolutionizing social media, making it easier for users to locate and communicate with friends and business associates, fight inappropriate or racist content, and enhance the user experience;

- Twitter uses deep neural networks to process data to learn user preferences,
- Facebook uses big data and artificial intelligence to target advertising, and
- Instagram uses chatbots to target advertising and fight to cyberbully and delete offensive comments.
- Chatbots recognize words and phrases to deliver helpful content to customers who have common questions.

Artificial Intelligence (AI) is an important part of digital assistants such as Siri, Google Now, Amazon's Alexa, and Microsoft's Cortana, which help users perform various tasks. AI is also used in self-driving and parking cars, which use deep learning to recognize the space around a vehicle. Nvidia's AI-powered technology is already in use in cars made by Toyota, Mercedes-Benz, Audi, Volvo, and Tesla, and is expected to revolutionize how people drive and enable vehicles to drive themselves.

Although all these AI is used in daily life there is still a misunderstanding of AI, that's why educators are trying to encourage students more about using artificial tools by providing examples of daily life uses.

Besides, Artificial Intelligence has been used to improve email communications, such as Smart Replies, Email Filters, Predictive Searches, and Web Searches which eases a lot of the daily working process. Smart Replies offer users a way to respond to emails with simple phrases like "Yes, I'm working on it." or "No I have not." Smart replies are tailored to the content of each email, and users can reply by typing a manual response or choosing a one-click smart reply.

Gmail filters attempt to sort emails into the following categories: Primary, Social, Promotions, Updates, Forums, and Spam. AI also helps organize emails into 4 different tabbed categories and sends spam mail to a separate folder. Another use of AI is to calculate traffic and construction to find the quickest route to a destination, such as Google Maps. More technology-related professions are more involved in AI such as commercial airline pilots reporting spending only 7 minutes manually flying the plane during a typical flight, with much of the rest being done by AI technology. Boeing is working to build jetliners completely piloted by AI, with no human pilots at the helm. HowArtificialIntelligenceIsImpactingOurEverydayLives | by Ilija Mihajlovic | Towards Data Science

A lot of people use smart replies without even a second of doubt even though if someone asks directly to them about AI, they will say they do not trust it.Newsletters used to promote AI pilots are seen as a useful way to present although youth is more involved in social media channels.

AI in Education Transformation

Generative AI is the use of artificial intelligence models to generate new data from existing data. These models learn patterns and relationships in a training dataset and use this knowledge to generate new examples that are similar to the training data.

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Embracing generative AI in the classroom requires;

- Educating ourselves,
- Modelling effective usage,
- Teaching potential benefits and pitfalls, and refining practice as new information is presented.

There are already researches on collaboration, teacher training, programmatic/assessment audit, modification of Semester One class work, community engagement, and sharing success stories is the dissemination of the researches.

The effective ideas to increase the sophistication of conversation with students, is to prioritize human skills, evolve signature CCGS experiences, and update policy. Also, parents must embrace the potential benefits and educate on the pitfalls of AI, while working towards a new normal which recognizes the role of AI in productivity.

PowerPoint Presentation (ccgs.wa.edu.au)

6.5 Summary

To conclude, the unit focuses on providing information on how to inform the public about AI and its power. It includes four parts: embracing AI in real life, introducing AI in a fun way, building a trust with AI, and creating a model of public trust in AI that differs from Trusted AI efforts. AI is part of fundamental global changes and its power is increasing, but humans still hesitate to develop, deploy, and use AI systems due to lack of trust in AI systems. Highlighting the public distrust of AI originates from the lack of a regulatory ecosystem that would guarantee the trustworthiness of the AIs that pervade society. The second part focuses on the Impact of AI on Public Relations and guidelines for staff training in PR. The third part focuses on AI that has become a part of our daily lives and offers businesses extraordinary capabilities to increase revenue and reduce costs. It is used in many areas of our lives. AI is revolutionizing social media, making it easier for users to locate and communicate with friends and business associates. Lastly, AI in Media and Society provides information about the education of public about AI and its role in education transformation.

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