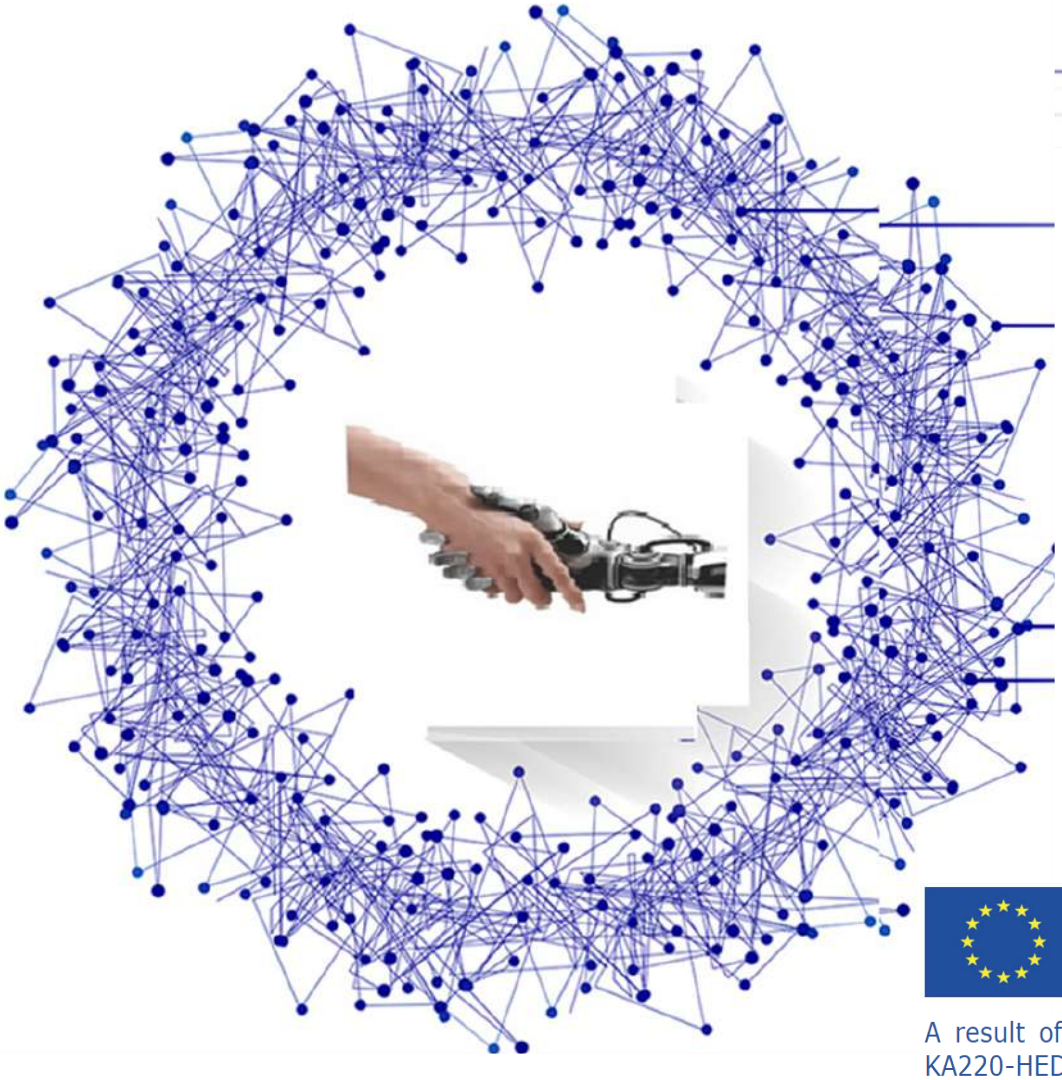
HEDY

Life in the AI Era

Guidelines



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HEDY PROJECT RESULT 4: GUIDELINES

CONTENTS

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I. DESCRIPTION

The HEDY Guideline, a product of the HEDY project, has been meticulously crafted to seamlessly integrate AI-related subjects into educational settings. Its primary objective is to furnish university professors, adult education facilitators, educators, and various stakeholders with succinct and easily comprehensible directives. This guideline revolves around three fundamental domains: harnessing the potential of the HEDY Massive Open Online Course (MOOC), optimizing the use of Toolkit resources, and executing a well-informed decision-making process for the comprehensive dissemination of AI-related subjects to a diverse audience of learners. Notably, the guidelines incorporate a glossary section that illuminates key terminologies and concepts pertaining to AI.

Introduction

The HEDY Guidelines serve as a resource by encouraging the use of the HEDY MOOC learning resources while providing guidance on the use of the Toolkit assets (video tools with AI content). The guidelines summarize the decisions made by the HEDY partnership during the process of creating and disseminating AI-related topics to students and adults. The HEDY Guidelines hold great promise for contribution to the education community and are poised to have a transformative impact. Currently available in multiple languages, including HU, PT, ES, CA, BG, DE and EN, these comprehensive guidelines are actively disseminated through a number of channels, with the HEDY website serving as a central conduit. TOOLKIT & MOOC users are already reaping the benefits of these guidelines. The value of the Guidelines extends beyond individual learners, as civil society organizations with a focus on AI-related areas can also benefit from their enormous potential. Using these guidelines, these organizations can organize high-impact community events that serve as catalysts for insightful discussion and informed civic engagement.

The transferability potential of the HEDY Guidelines underpins their universal applicability, overcoming boundaries and seamless integration into different education and training systems. The ripple effect of the HEDY Guidelines in the education community is palpable, fostering a better understanding of AI-related topics among both learners and educators, and spearheading the advancement of educational practices in general. As the education landscape continues to evolve, the HEDY Guidelines are at the forefront, driving innovation, inclusion and excellence across the education sector.

Target Audience

The HEDY Guidelines are primarily aimed at higher education teachers, vocational training providers, professionals and other stakeholders. Recognizing the transformative nature of the education system, the guidelines provide learners, educators and promoters with the necessary skills to effectively navigate the virtualized learning environment. The HEDY Guidelines serve as an indispensable resource, specifically tailored to meet the diverse needs of a discerning stakeholder audience. Recognizing the inherently transformative

nature of the education system, these guidelines equip both learners and educators and facilitators with the essential skills and competencies needed to navigate the virtualized learning environment. Recognizing the dynamic nature of the educational landscape, these guidelines act as a compass, guiding and supporting stakeholders in the learning process.

Innovation

The HEDY guidelines include several innovative aspects drawn from the experience and reflections of the project. The guidelines emphasize the flexible use of audio-visual tools (tool database) and MOOCs, facilitating engaging learning experiences and increasing the sustainability of the HEDY project. With a focus on adaptability and evolution, these guidelines usher in a new era in educational practice by emphasizing the flexible use of state-of-the-art audio-visual tools drawn from the extensive tool database. By seamlessly integrating these tools with the MOOC platform, the Guidelines foster a transformative learning environment that transcends traditional boundaries and embraces the dynamic nature of modern education. At the heart of this innovation is the profound potential to create engaging and immersive learning experiences. Using the power of audio-visual tools, learners and educators are empowered to explore AI-related topics. This innovative approach not only increases the overall efficiency of the educational process, but also serves as a catalyst to promote the long-term sustainability of the HEDY project. The guidelines serve to guide educators and learners through the ins and outs of using the MOOC toolkit and platform assets. This innovative integration of technology and pedagogy lays the foundation for meaningful interactions that foster critical thinking, collaboration, and creativity. By sharing good practices, the guidelines provide valuable guidance on key aspects such as course structure, content development, teaching strategies, assessment methods. At its core, the HEDY Guidelines represent a ground-breaking innovation in education.

Impact

The HEDY guidelines are available in several languages, including HU, PT, ES, CA, BG, DE, and EN. The guidelines overcome language barriers, allowing a wider audience to benefit from the wealth of knowledge and insights. They were strategically distributed through various channels, including the HEDY website, to ensure widespread accessibility and engagement, and serve as a resource guiding learners to effective and efficient learning processes. Providing clear and practical guidance, the guidelines enable users to navigate complex AI topics with confidence and ease. The impact of the HEDY Guidelines extends beyond individual users to civil society organizations with a specific focus on AI-related issues. By adhering to the principles and best practices of the Guidelines, these organizations foster meaningful discussion. The Booklet is an essay defining the HEDY position on the life in the present AI era. It describes and presents the results of a two-fold approach we implemented to build our rationale about the challenges, opportunities and expected impact of AI, with particular emphasis on four specific areas: business, governance, skill &

competencies, and people & lifestyle. This two-fold approach consisted of analysing information from two sources: i) Literature survey, and ii) Interview with people. The first source of data focussed on collecting the current state of knowledge about the impact of AI and came from the available literature on AI in general and on the four ambits described above in particular. The aim was to acquire an in-depth grasp of the subject allowing us to: i) identify relevant theories, methods, and opinions in the existing state of the art and report them in the Booklet; and ii) organise and guide the participants through the focus groups with these bases already learned so to obtain the complementary information we needed. The second source of data consisted of gathering information by interviewing people through 10 focus groups conducted in 5 different European countries: one focus group with only experts in AI and one focus group with only non-experts in AI per each country.

The final version of the Booklet (in English was published in October 2022 in the project website and in the Zenodo platform (doi: 10.5281/zenodo.7426885). Since then, we have also produced the versions in Hungarian, Bulgarian, Portuguese, German, Spanish and Catalan.

So far, we have used the Booklet and its content for the following other initiatives:

- The publication of a paper in the SEFI2022 conference, held in Barcelona, Spain on September 19-22, 2022 (https://sefi2022.eu/proceedings).
- The publication of a special issue in the Safety and Security Sciences Review journal "HEDY - Life in the AI age", on October 2022 (https://biztonsagtudomanyi.szemle.uni-obuda.hu/index.php/home/issue/view/21).
- The preparation of the HEDY MOOC. Indeed, the research investigations conducted during the preparation of the Booklet have been used as the basis for the lectures of the HEDY MOOC.

The Guidelines act as a catalyst, bringing individuals and communities together in the pursuit of AI literacy and awareness. They transcend the boundaries of specific education and training systems, ensuring their relevance and applicability in different contexts and environments. The transferability of guidelines facilitates the global dissemination of knowledge, fostering a collaborative community of learners and educators.

II. HEDY BOOKLET

The current versions of the Booklet can be used in different ambit. The Booklet provides an analysis about how the AI is currently impacting our society. This analysis starts with a research investigation from the available literature, which means the Booklet contains 1) a list of current state-of-the-art publications on the subject and 2) the summary and main results of these publications. Hence, the Booklet can be used as a source point to acquire an in-depth grasp of the current knowledge on the subject. In addition, the Booklet provides a unique contribution on AI panorama as it collects information from different social actors' opinions and debated questions, concerns, and ideas through the 10 focus groups conducted in 5 different European countries. This is a differential factor with respect to conventional

state-of-the-art surveys: real opinions from experts and non-experts in AI give point of views and real-life examples that can rarely be found in literature.

Therefore, the Booklet could be used by teachers in high education: they can refer to this work in their lectures and/or use it to prepare the content of their lecture. It can be used for personal development, both for experts and non-experts in AI. It can be used for further research investigations on the subject. In this direction, it is worth mentioning that the Booklet was prepared during the first of the HEDY project, namely November 2021-October 2022. It is important to highlight this timeframe because ChatGPT was launched on November 30, 2022. It means the Booklet contains data and results obtained before the advent of ChatGPT. It may therefore result of particular interest to perform a similar analysis now and compared the results with the ones available in the Booklet.

The Booklet and all its translations in 7 languages can be downloaded from the project website (https://lifeintheaiera.eu/2023/02/24/hedy-booklet-en/)

III. HEDY TOOLKIT

Within the context of Massive Open Online Courses (MOOCs), the Hedy Toolkit emerges as an excellent resource with a big potential to enhance the learning experience. This comprehensive collection of tools, materials, and resources complements the MOOC curriculum, serving as a catalyst for deeper engagement and enriched knowledge acquisition. By integrating the Hedy Toolkit into the MOOC framework, learners gain access to a diverse range of assets that extend beyond traditional course content. These resources encompass videos, presentations, interactive exercises, and supplementary materials carefully designed to augment the learning journey. Leveraging the Toolkit within the MOOC environment empowers learners to explore topics in greater depth, broaden their understanding, and apply their newfound knowledge in practical contexts. Learners can leverage the videos to gain insights from subject matter experts, delve into thought-provoking discussions, and witness real-world applications of AI. The presentations provide visual representations and concise summaries of complex ideas, aiding in comprehension and retention. Additionally, the interactive exercises and supplementary materials offer opportunities for hands-on exploration, allowing learners to apply theoretical knowledge to practical scenarios. Learners can leverage the Toolkit beyond the confines of the MOOC platform, revisiting videos, presentations, and materials as a reference for further exploration and self-paced learning. This post-MOOC engagement empowers learners to deepen their understanding, stay updated with emerging trends, and continue their journey of knowledge acquisition long after the MOOC concludes. In essence, the integration of the Hedy Toolkit within the MOOC environment transforms the learning experience into a dynamic and multifaceted endeavor. By leveraging the diverse assets provided, learners can enhance their comprehension, engagement, and retention of AI-related concepts. The Toolkit's integration amplifies the impact of the MOOC, cultivating a comprehensive and immersive learning environment that nurtures curiosity, fosters skill development, and empowers learners to navigate the

ever-evolving field of Artificial Intelligence. Furthermore, the materials presented in the toolkit can be used for extracurricular activities in the classroom or serve as debate promoting material in workshops and conferences. The use of the HEDY toolkit is flexible. Therefore, it is recommended to choose the most relevant topics and movies based on individual interest.

IV. HEDY MOOC

The main objective of the HEDY MOOC is to serve as a free and accessible source of information regarding the digital technologies of the 4th industrial revolution (Industry 4.0), with a specific focus on Artificial Intelligence (AI).

Through its free and accessible platform, the MOOC enlightens participants about the positive future applications of AI while raising awareness about potential impacts, including threats to human rights and democracy. The HEDY MOOC promotes critical reflection and self-based learning, encouraging learners to engage in meaningful debates on these crucial topics by offering a comprehensive view of how AI is reshaping our socioeconomic, cultural, and human environments.

One of the main strengths of the HEDY MOOC lies in its emphasis on enhancing digital literacy among participants. As AI continues penetrating various aspects of daily life and work, the MOOC equips learners with the necessary skills and knowledge to navigate a world increasingly reliant on algorithms and technology. By fostering a culture of lifelong learning, the course empowers individuals to keep pace with the rapidly evolving digital landscape and adapt to the constant innovations in the field. Participants can complete assignments independently, promoting a flexible and inclusive learning environment accommodating diverse learning styles and schedules.

The main modules of the HEDY MOOC are as follows:

The Age of Data and the Impact of Cyber-Physical Systems in the 4th Industrial Revolution (Industry 4.0): This topic explores the significance of data and cyber-physical systems' role in the fourth industrial revolution (Industry 4.0). It examines how these advancements transform various industries and drive changes in different sectors.

Impact on Business: Effects on customer expectations, product enhancement, collaborative innovation, and organizational forms. Global platforms and new business models: This topic focuses on the impact of artificial intelligence on businesses, including its effects on customer expectations, product enhancement, collaborative innovation, and the emergence of new organizational structures. It also delves into the role of global platforms and new business models in this AI-driven era.

Impact on Governance: Effects on public policy objectives and assisting the public to interact with the government through intelligent interfaces. This topic explains the influence

of AI on governance, including its effects on public policy objectives and how it facilitates interactions between the public and the government through intelligent interfaces. It also discusses the benefits and socioeconomic risks associated with AI advancements.

Impact on Skills & Competencies: Effects on shifting education systems' priorities. This topic examines how AI impacts the required skills and competencies in the workforce, leading to shifts in education systems' priorities. It addresses concerns about potential job loss and the automation of various job activities in the coming decade.

Impact on People & Lifestyle: Effects requiring AI readiness, understanding its impact on personal and societal aspects. This topic delves into the effects of AI on individuals and society. It emphasizes the importance of AI readiness and understanding its influence on various aspects of daily life and societal dynamics.

The HEDY MOOC begins with a general introduction, providing an overview of the course, including its objectives, the formal requirements, guidance on the use of the platform, and a warm-up exercise.

The central part of the HEDY MOOC proceeds with five sets of twin modules, each exploring the topics mentioned above.

At the end of the course, participants will undergo assessment and evaluation related to the content covered during the MOOC. This evaluation measures the competencies and their depth acquired, as stated in the course description.

This evaluation measures the participants' grasp of the key learnings and insights presented throughout the course.

Additionally, a collaborative platform will allow participants to engage in discussions, share their perspectives, and interact with fellow learners, fostering a dynamic learning environment.

The HEDY MOOC stands out not only for its comprehensive presentation of the social impact of artificial intelligence but also for its unique approach to incorporating film art into the course materials. Filmmaking plays a distinguished role in processing various topics covered in the MOOC. The HEDY Toolkit offers a collection of film works, and TED Talks recommended for students to explore and analyse based on specific criteria.

The creation of HEDY Talks aimed to deliver concepts to students in high-quality visual form. These talks provide an engaging way to present ideas and concepts through live speeches.

Throughout the course, there are opportunities for collaboration among participants. Scheduled live chats and numerous forums enable students to engage in discussions, share

their work, and exchange ideas with fellow learners. This collaborative environment fosters interaction and enhances the learning experience.

By integrating film art, spoken presentations, and collaborative elements, the HEDY MOOC offers a unique and multi-dimensional learning experience. It combines different forms of media to enhance understanding, spark creativity, and facilitate meaningful discussions among participants. This approach ensures that learners not only gain knowledge about the social impact of AI but also engage with the content dynamically and interactively, encouraging knowledge exchange.

Primary use of HEDY MOOC

University students can derive several specific benefits from the HEDY MOOC due to its design and content. The course's learning objectives revolve around providing an in-depth understanding of the societal impact of artificial intelligence. Through the modules, students will explore AI's influence on different areas, such as business, governance, skills and competencies, and people's lifestyles.

University students can develop essential competencies for the AI-driven future by engaging with the HEDY MOOC. They will enhance their critical thinking abilities as they analyze the implications of AI on society, jobs, and decision-making processes. Ethical awareness will be nurtured through discussions about the moral dilemmas raised by AI's increasing role in various aspects of life.

The MOOC caters to students' interests by incorporating film artworks and TED talks into the learning process. This innovative approach makes the content more captivating, encouraging active participation and stimulating intellectual curiosity. Moreover, the diverse range of topics and case studies allows students to explore specific areas of AI that align with their passions and career aspirations.

Considering students' busy and diverse lifestyles, the HEDY MOOC offers flexible learning options. Students can access the course materials online, allowing them to manage their study time conveniently. This accessibility makes it easier for university students to balance their academic commitments, part-time jobs, and personal activities while engaging in meaningful and relevant learning experiences.

The HEDY MOOC empowers university students by equipping them with the knowledge and skills to navigate the AI-driven world effectively. It addresses their learning objectives, fosters crucial competencies, aligns with their interests, and accommodates their lifestyle, making it a valuable educational resource for this target group.

Additional use cases

Secondary target groups of HEDY MOOC are:

- Educators and teachers seeking to expand their knowledge of artificial intelligence and its societal impact to incorporate it into their teaching and curriculum;
- Continuing Professional Development (CPD) students who are professionals looking to upskill and stay updated with the latest developments in AI and its applications in various fields and
- Adult Education Students pursue lifelong learning and seek to enhance their knowledge of AI and its impact on different aspects of life.

Lecturers, educators, and teachers can leverage the HEDY MOOC as a valuable teaching resource. The MOOC provides freely available, high-quality learning material on artificial intelligence and its societal impact. By incorporating the content from the HEDY MOOC into their courses, educators can enhance their teaching materials with up-to-date and comprehensive information on AI.

The course's well-structured modules and learning objectives enable lecturers to align their teaching plans with the most relevant AI topics and competencies. The engaging format, which includes film artworks and TED talks, can captivate students' interest and foster a deeper understanding of AI's impact on society.

Using the HEDY MOOC in their teaching allows educators to stay current with the latest developments in AI and related fields, which is crucial for providing students with relevant and cutting-edge knowledge. The freely accessible nature of the course also makes it an inclusive educational tool, enabling more students to access high-quality AI education regardless of their background or location. As a result, lecturers can create a more enriching and comprehensive learning experience for their students, preparing them for the challenges and opportunities presented by the age of artificial intelligence.

Continuing Professional Development (CPD) students, professionals seeking to upskill and stay updated in their respective fields, can significantly benefit from the HEDY MOOC. As the course comprehensively covers the societal impact of artificial intelligence, it provides CPD students with valuable insights into the latest developments and applications of AI in various industries.

For CPD students, the HEDY MOOC offers a flexible and accessible learning platform. They can engage with the course content at their own pace, fitting their studies into their busy professional schedules. The MOOC's interactive forums and collaborative platform allow CPD students to network with peers from diverse backgrounds, fostering knowledge exchange and discussions on AI-related topics.

The content's emphasis on critical reflection and debate enables CPD students to explore AI's implications for their specific fields and industries. CPD students can make informed decisions and incorporate AI strategies into their professional practices by gaining a deeper understanding of AI technologies and their potential impact.

As AI continues transforming industries, staying updated with the latest advancements becomes essential for professionals. The HEDY MOOC is an invaluable resource for CPD students, providing them with relevant and up-to-date knowledge on AI, thus empowering them to excel in their careers and contribute effectively to the rapidly evolving landscape of artificial intelligence.

Adult education students can find significant benefits from participating in the HEDY MOOC. As individuals seek to enhance their knowledge and skills in artificial intelligence and its societal impact, the MOOC offers a valuable learning opportunity. The course content is designed to be accessible and engaging for adult learners, catering to their diverse backgrounds and learning styles.

For adult education students, the HEDY MOOC is a gateway to understanding the complexities of artificial intelligence and its implications for society. The comprehensive coverage of AI topics allows them to develop a well-rounded understanding of the subject, regardless of their prior knowledge in the field.

The self-paced nature of the MOOC enables adult learners to study at their convenience, accommodating their work and personal commitments. The collaborative platform and interactive forums also foster a sense of community, allowing adult education students to connect with peers, share ideas, and engage in meaningful discussions about AI-related issues.

By completing the HEDY MOOC, adult education students can acquire essential competencies in the AI domain, empowering them to make informed decisions and contribute to relevant discussions in their personal and professional lives. The course's emphasis on critical reflection and debate enables them to think critically about AI's impact on society, making them better equipped to navigate the ethical and societal challenges associated with AI technologies.

Partial MOOC utilisation

The HEDY MOOC offers a valuable resource to consider for educators aiming to enrich their course curriculum with cutting-edge insights into artificial intelligence (AI) and its societal impacts. Rather than adopting the entire course, educators can select specific modules or topics that align with their teaching objectives and seamlessly integrate them into their existing courses. Whether focusing on the Age of Data and the Impact of Cyber-Physical Systems, the Impact on Business and Organisational Forms, the Skills & Competencies, or any other engaging topic covered in the HEDY MOOC, educators can cherry-pick the most relevant content.

Integrating HEDY MOOC components into existing courses can bring multiple benefits. First and foremost, it provides students with diverse learning materials, including TED talks, film artworks, and expert-authored content, fostering a more comprehensive

understanding of AI's complexities. The curated resources can supplement traditional lectures and textbook materials, enhancing student engagement and knowledge retention.

Incorporating HEDY MOOC materials allows educators to expose their students to state-of-the-art insights and developments in AI, ensuring they stay abreast of the latest trends and advancements. This exposure is invaluable in preparing students for real-world challenges and equipping them with skills sought after in today's job market.

The HEDY MOOC segments can save educators valuable time and effort, as the content is thoroughly developed, peer-reviewed, and tested through a pilot course. By leveraging the expertise of the HEDY project consortium, educators can focus on delivering high-quality instruction, facilitating discussions, and guiding students' learning journeys.

While adapting HEDY MOOC content to fit specific courses, educators can create assessments and assignments tailored to their student's needs and learning objectives. This customisation allows for seamless integration of the HEDY MOOC materials into diverse educational settings and disciplines.

The HEDY MOOC's modular design and freely accessible resources make it a versatile and user-friendly tool for educators seeking to enhance their courses with relevant, cutting-edge AI-related content. By thoughtfully integrating selected parts of the HEDY MOOC, educators can foster a dynamic and enriched learning experience, preparing their students to thrive in an AI-driven world.

Extended HEDY MOOC

The HEDY MOOC, combined with classroom sessions and real-life practical exercises, offers students a captivating exploration of AI and its societal impacts. Educators who opt for this multimodal approach allow students to deepen their knowledge and experience of AI in real-world situations.

By integrating the HEDY MOOC with hands-on exercises in the classroom, educators can create a dynamic learning environment that fosters critical thinking and problem-solving skills. During these sessions, students can apply the concepts learned in the MOOC to analyze real AI applications, understand ethical considerations, and discuss the broader societal implications of AI implementation.

Moreover, incorporating real-life scenarios into the learning process enables students to witness AI's impact on various industries and sectors. This approach helps bridge the gap between theoretical knowledge and practical application, preparing students to tackle real-world AI challenges confidently.

Additionally, the classroom sessions provide a platform for collaborative learning, where students can engage in group discussions, share their insights, and collaborate on

AI-related projects. Classroom sessions foster community and encourage active participation, enhancing the overall learning experience.

Based on the HEDY project expertise, by combining the HEDY MOOC with classroom sessions and real-life exercises, educators can deliver a comprehensive and enriching AI education that equips students with the skills and understanding needed to navigate the rapidly evolving landscape of artificial intelligence.

Technical solution

Moodle

The technical implementation of the HEDY MOOC took place at the Carpathian Basin Online Education Center (KMOOC), within the Óbuda University's freely accessible distance learning system. The dedicated Moodle server and the team of Moodle experts at the University provide the technical infrastructure.

The course is available in both English and Hungarian languages, and the HEDY MOOC partners host the remaining available language versions.

Time schedule

Students can complete the course with the typical duration spanning two semesters: from mid-September to mid-December for the autumn semester and from mid-February to mid-May for the spring semester.

Registration

Participants can register quickly, enrol in the course and access the course materials conveniently through the KMOOC.

To access the HEDY MOOC go to https://www.kmooc.uni-obuda.hu/course/134.

Certification

Upon successful completion, students can request a certificate confirming their participation in the university course and acquire four credit points from the Óbuda University's Bánki Donát Faculty of Mechanical and Safety Engineering, where this subject is accredited as an elective course.

For those who choose not to provide their data during registration, the entire course material can be downloaded in pdf format directly from the project website. However, with registration in the KMOOC, interactive features will be available, and the opportunity to earn credits will be forfeited.

To complete the course, participants need access to a computer with an internet connection, a media player and a text editor, which are generally necessary for distance learning systems. As the course involves the analysis of film artworks, participants will need

access to a video repository. Participants can propose alternative films and complete the assignments using those artworks when they are prevented from watching a designated movie.

CREATE HEDY MOOC

Understanding the complex relationship between humans and AI is paramount in today's technology-driven world. The MOOC is important because AI technologies have the potential to impact various aspects of human life.

Through the creation of MOOCs, experience shows that a well-structured human-AI relationship course provides learners with a comprehensive understanding of these aspects. Reflecting on practices and outcomes in MOOC creation highlights the need for multidisciplinary perspectives, engagement with real-world examples, and interactive elements to promote active learning and critical thinking. By imparting this understanding, MOOCs will contribute to a more informed and responsible approach to AI.

The course structure will consist of an introduction, modules and an assessment. The course content should include a description of the requirements, basic concepts of AI and history of AI, ethical considerations, the relationship between humans and artificial intelligence. It will include AI application areas - industry 4.0 (5.0), MIA and the SME sector, governance and legislation. Attention will be paid to the application of AI in economic life, the labor market, education, the arts, the prospects for its development.

In the teaching and learning process, it is important to present the content in an engaging way. Use a combination of lectures, interactive elements, case studies and real-world examples to keep learners engaged. To have opportunities for learners to discuss and exchange ideas with other participants. Practical tasks and projects that specifically teach you to apply your knowledge and think about the human-AI relationship are important.

In the teaching and learning process, it is good to include interactive elements to test knowledge and simulations to reinforce learning and encourage active participation. Case studies illustrate the complexity of the human-AI relationship, allowing learners to analyze real-world scenarios and propose solutions. Provide discussion forums where learners can interact, ask questions, share insights, and engage in peer learning. Assign hands-on exercises, assignments, or projects that require learners to apply their knowledge and think critically about the human-AI relationship.

Assessment to include quizzes, knowledge checks and short assignments in each module to assess learners' understanding as they progress through the course. Students receive a comprehensive final assessment or project that assesses learners' overall understanding and application of course content. Students who successfully complete the course and meet the

assessment requirements will receive a course completion certificate. The course can be self-paced or on a fixed schedule, depending on the target group.

During the course completion, in addition to acquiring the knowledge provided by the written materials, the world of AI can be learned through exercises, and there is also the opportunity to discuss various issues related to the topic with other course students. Completing the online course does not require specialist qualifications, only basic digital skills. Its target group is a wide range of university students, teachers, and adults interested in the topic. The course is 15 hours long, which can be completed in 5-10 weeks on the Moodle platform, and its schedule is adapted to the university semesters. For successful completion, the total amount of time expected from students is 30-90 hours, optimally broken down by modules, with the schedule of 12 weeks with the final test.

HEDY MOOC principles

The HEDY Project has accumulated valuable insights from its experiences in e-learning material development. Drawing from the expertise of the HEDY Project, the following principles have been identified as essential guidelines for crafting this educational journey:

- User Focus: Begin by defining the target audience and keeping their characteristics in mind throughout development.
- Skill Development: Ensure that the entire learning material and its sections lead to acquiring specific skills. Participants should clearly understand what they will be capable of after completing each section.
- Problem-Centric Approach: Relate the learning material to the participants' real-life problems and interests, adding value to their actual situations.
- Transparency: Participants should be familiar with the learning process, knowing what they are working on, what they have already accomplished, and what lies ahead.
- Immersion: Engage participants deeply in the learning process, making the course enjoyable so that time passes without them noticing.
- Feedback: Provide participants with regular feedback on their learning progress, completed tasks, and allow them to assess their performance.
- Presence: Encourage active participation from participants and instructors, creating a shared learning experience.
- Flexible Time Management: Apart from a final deadline for the course, avoid imposing strict time constraints on participants, allowing them to learn at their own pace.
- Independent Exploration: The course should contain essential knowledge for learning, but it should also offer diverse opportunities for participants to build upon and acquire additional complementary understanding.

- Continuous Updating: Incorporate automation to keep the course up-to-date by leveraging student assignments to process the latest developments in the field. Integrate these findings into the current or upcoming version of the learning material.

Following the HEDY MOOC principles can be highly beneficial as it provides a well-structured and tested framework for creating practical AI-related e-learning courses. While the implementation may seem straightforward when described, it can be challenging when being done. However, during the HEDY project implementation, the HEDY MOOC was developed in multiple stages, and the reviewed course materials were tested through a pilot course. This pilot allowed for participant feedback and analysis of their activities, enabling the MOOC to be refined and finalized according to user needs and the HEDY principles.

Applying this guide is fortunate as it helps creators of similar programs, like HEDY, to avoid the pitfalls and challenges encountered during development. By learning from the experience of the HEDY project, other course developers can make informed decisions, incorporate our good practices, and ensure that their courses align with the principles that make the HEDY MOOC successful.

Good practice

During the implementation of the Hedy project, a comprehensive 20-step instructional design was tailored specifically to address the complexities found in artificial intelligence (AI) education. This process is uniquely designed to cater to the complex nature of AI concepts and their societal impact, making it ideal for creators of AI-related educational materials.

The instructional design process starts with clearly defining the target audience, considering the diverse range of learners, from university students to professionals seeking to upskill in AI. Next, the learning objectives and competencies are carefully identified, aligning with Bloom's Taxonomy to ensure a well-rounded understanding of AI concepts at various depths.

Curriculum planning involves structuring the content into modules and topics, balancing theory and practical applications, and devising assessment methods to gauge learners' comprehension. Whether video-based, text-based, or a blended format, the chosen approach should ensure engagement and interaction, catering to different learning styles and preferences.

For the technological implementation, using dedicated platforms, like MOODLE, provides a seamless learning experience while allowing learners to access the course at their own pace. Multimedia elements, such as video recordings with subtitles, enhance learning and foster a deeper understanding of AI concepts.

Furthermore, the Hedy project emphasizes collaboration, enabling learners to participate in live discussions, chats, and forums to share ideas and interact with peers.

Collaborative solutions lead to a dynamic learning community where learners can learn from each other's perspectives and experiences.

User feedback plays a crucial role in refining AI-focused educational content. Pilot courses and constant evaluation ensure the material remains up-to-date, accurately represents AI advancements, and aligns with learners' evolving needs.

Define the target audience: The first crucial step in developing the HEDY MOOC or any course is identifying the target audience. The HEDY MOOC includes university students and adult learners interested in gaining comprehensive knowledge about the societal impact of artificial intelligence (AI). By defining the audience, the course creators can tailor the content, delivery method, and learning outcomes to meet the learners' needs and preferences. Whether it's catering to the general university student population or a specialized group within a particular field, this clarity helps maintain focus and relevance throughout the course.

Determine learning outcomes: for effective learning, it is essential to establish clear and measurable learning outcomes for the course. These outcomes define what learners are expected to achieve upon completing the HEDY MOOC. Using Bloom's taxonomy, the course developers can delineate competencies and depth of knowledge that participants should attain. By doing so, they can design assessments, activities, and content that align with the desired learning goals, fostering a structured and purposeful learning experience.

Design the curriculum: The curriculum design involves organizing the HEDY MOOC into cohesive modules and topics. Each module should present a logical progression of concepts, offering a blend of theoretical knowledge and practical applications. Introducing different assessment methods ensures comprehensive evaluation of learners' understanding. Furthermore, the curriculum design should consider factors like the appropriate duration of the course, pacing, and assessment strategies to provide learners with a balanced and effective learning journey.

Choose the approach for content delivery: Selecting the most suitable method for content delivery is pivotal to the success of the HEDY MOOC. Course developers must decide whether to employ video-based lessons, text-based materials, or both. Additionally, they must determine if the course will be entirely online, a blended learning experience, or incorporate group collaboration. Striking a balance between engaging multimedia content and interactive learning activities helps cater to diverse learning preferences and maximizes learners' knowledge retention.

Select appropriate technology and platforms: The technical implementation of the HEDY MOOC relies on choosing the right technology and media to host the course content. For instance, utilizing a platform like Moodle offers a user-friendly and accessible environment for learners to navigate through the course material. Ensuring compatibility

with various devices and providing a seamless user experience contributes to a positive learning journey.

Plan the visual appearance of the course: Aesthetics and user experience play a significant role in engaging learners. Creating an appealing and intuitive interface enhances learner motivation and facilitates a seamless navigation experience. Clear and visually appealing layouts and consistent design contribute to a cohesive and professional-looking course.

Develop the course content: This step involves creating comprehensive and engaging content for each module. In the case of the HEDY MOOC, content creators may use a wide array of resources, such as film artworks and TED talks, to enrich learners' understanding of AI's societal impact. Developing detailed scripts for each lesson or module ensures the course content is coherent, well-structured, and adheres to the learning objectives.

Conduct regular consultations and discussions: Collaboration and communication among the course development team are vital to ensure the smooth progression of the HEDY MOOC. Regular talks and discussions help identify potential gaps or inconsistencies in the content and address them promptly. Feedback from subject matter experts and educators ensures that the course meets academic standards and aligns with the project's objectives.

Produce video recordings and provide subtitles: In the HEDY MOOC, using video recordings and subtitles helps enhance learners' comprehension and accessibility. Providing clear and accurate subtitles for visual content enables learners with diverse needs, such as non-native English speakers or those with hearing impairments, to fully engage with the course material.

Create clear and well-defined assignments and tasks: Designing well-structured assignments and tasks within the HEDY MOOC encourages active learning and helps learners apply their knowledge. Clearly outlining the expectations for each assignment fosters a sense of direction and purpose, motivating learners to participate and demonstrate their understanding of the course content actively.

Implement self-assessment opportunities: Including self-assessment options in the course allows learners to monitor their progress and comprehension. Providing quizzes or self-check exercises will enable participants to gauge their understanding, identify areas for improvement, and reinforce their learning.

Design assessment methods and quizzes: Developing diverse and informative assessment methods helps evaluate learners' grasp of the course material accurately. These assessments can be in quizzes, written assignments, or practical projects, ensuring a comprehensive evaluation of learners' knowledge and competencies.

Unify and organize the course content: Bringing together the different elements of the HEDY MOOC into a coherent and unified structure is essential for a smooth learning experience. An organized and well-structured course enables learners to navigate the material seamlessly, ensuring they get all important information.

Review and approve the course content: A thorough review and approval process must occur before technical implementation, which involves validating the accuracy, consistency, and quality of the course content. Any necessary revisions and updates can be made during this stage to ensure the course meets the highest standards.

Execute the technical implementation of the course: With the content ready, the course developers proceed to implement the HEDY MOOC on the chosen platform, such as the Kárpát-medencei Online Oktatási Centrum (KMOOC) for the HEDY project. This technical implementation ensures all course materials are uploaded and accessible to learners.

Conduct a pilot course: Conducting a pilot course with the target audience provides valuable feedback and insights to fine-tune the HEDY MOOC. Learners' feedback allows the course developers to identify areas of improvement, validate the effectiveness of the course structure and content, and make any necessary adjustments.

Evaluate and validate the course: Following the pilot course, a comprehensive evaluation involves the target audience and subject matter experts. This evaluation aims to validate the course's effectiveness, relevance, and alignment with the project's objectives and intended learning outcomes.

Fine-tune and refine the course content: The HEDY MOOC undergoes further refinements and improvements based on the feedback and evaluation results. This iterative process helps ensure the course's continuous enhancement and relevance to learners' needs.

Seek accreditation (if applicable): In the case of a university course, seeking accreditation is crucial to ensure that learners receive recognized academic credits for completing the HEDY MOOC. Meeting the necessary criteria and aligning with academic standards enhances the course's credibility and value for participants.

Advertise and maintain the course: Once the HEDY MOOC is ready for delivery, it is advertised to the target audience to encourage enrollment. Course maintenance and support are essential throughout its availability to address technical issues, respond to learners' inquiries, and ensure a positive learning experience. Regular updates and revisions may be implemented to keep the course content up-to-date and relevant.

V. CONCLUSION

Guidelines Implementation - Content offered in an easy friendly way, with examples calling for action and illustrated in a systematic way, whenever possible, with best practices and examples collected within project ongoing development, such as multiplier events, debates held, reflections taken, suggestions collected, feedback got, etc.

The development of the HEDY Guidelines is the result of the collective efforts, expertise and support of many people and organizations. We would like to express our sincere gratitude to everyone who contributed to this result. We would like to acknowledge the contributions of the project team members. Their careful research, attention to detail and effort in developing, revising and improving the Guidelines are essential to ensure their quality and relevance. We would like to thank the European funding program Erasmus+, which provided the financial support and resources to make this project possible. Their vision and commitment to promoting AI competence was instrumental in making this project a reality. We are grateful to the educational institutions, higher education teachers and professionals, learners and users whose engagement and feedback are a constant source of inspiration and motivation. The collective effort paved the way for a more informed, ethical and inclusive educational product on AI.

VI. GLOSSARY

Algorithm: A step-by-step procedure or set of rules for solving a specific problem or completing a specific task. In the context of AI, algorithms are used to process data and make predictions or decisions. *(ref.: https://doi.org/10.3390/math10091544)*

Artificial Intelligence (AI): The field of computer science that focuses on creating intelligent machines capable of performing tasks that would typically require human intelligence. AI encompasses several subfields, including machine learning, natural language processing, and computer vision. *(ref.: https://doi.org/10.3390/math10152552)*

Art AI: AI-powered art spans multiple mediums, including visual art, music, literature and performance. AI algorithms can be used to create original artwork, compose music, write poetry, and even produce interactive installations. Artists and creators can use AI technologies to explore new artistic possibilities, challenge conventional artistic norms, and engage audiences in unique and thought-provoking ways. The intersection of AI and art raises important questions about the role of technology in the creative process, the notion of authorship, and the relationship between human creativity and machine intelligence. It sparks discussions about the boundaries of artistic expression, the ethical implications of AI-generated art, and the potential impact on the art industry and cultural landscape. *(ref.: https://doi.org/10.3390/arts8010026)*

Augmented Reality (AR): A technology that superimposes digital information, such as images or text, on the real world to enhance the user's perception and interaction with their environment. AI can be used in AR applications to enable object recognition, real-time

tracking and the display of contextual information. *(ref.: https://doi.org/10.3390/diagnostics13050892)*

Big Data: Very large and complex data sets that cannot be easily processed using traditional data processing methods. Big data often involves the analysis of vast amounts of information to extract valuable insights and patterns. *(ref.: https://doi.org/10.3390/electronics12040957)*

Biometrics: Biometrics refers to the measurement and analysis of unique physical or behavioral characteristics of individuals. In the context of AI, biometrics plays a significant role in identification, authentication, and security systems. It involves the use of advanced algorithms and machine learning techniques to extract and analyze biometric data, such as fingerprints, facial features, iris patterns, voiceprints, and gait patterns. AI-powered biometric systems are capable of accurately recognizing and verifying individuals based on their biometric traits, enabling secure access control, surveillance, and personal identification applications. The integration of AI with biometrics enhances the efficiency, accuracy, and reliability of biometric systems, leading to advancements in areas such as facial recognition, fingerprint identification, and voice authentication. *(ref.: https://doi.org/10.3390/info14020065)*

Biometric identification: Biometric identification is a process that uses unique physical or behavioural characteristics of individuals to establish their identity. In AI, biometric identification refers to the application of artificial intelligence techniques to analyse and match biometric data for identification purposes. This involves the capture and processing of biometric characteristics such as fingerprints, facial features, iris patterns, voiceprints or behavioural characteristics such as gait patterns. AI algorithms are used to extract distinctive features from the biometric data and create a unique template or representation for each individual. These templates are then compared to a database of pre-registered templates to determine an individual's identity. AI-powered biometric identification systems offer higher accuracy, speed and scalability compared to traditional methods, enabling secure and efficient identity verification in various fields such as law enforcement, access control and personal authentication. *(ref.: https://doi.org/10.3390/en15197430)*

Biometric recognition: Involves automated identification or verification based on unique physical or behavioural characteristics. AI-powered biometrics include face and hand recognition. Facial recognition uses AI algorithms to analyse facial features in images or video. It captures and processes features such as facial shape, landmarks and attributes to identify or verify individuals. Applications include security, access control, surveillance and personalised experiences. Hand recognition focuses on unique hand features. AI-based systems use computer vision to extract hand shape, palm lines, finger positions or gestures for identification or verification. It is used in biometric access control, gesture interfaces and sign language recognition. Biometric recognition systems, including face and hand recognition, use AI algorithms for efficient and accurate identification. While offering convenience and security, ethical and privacy concerns as well as potential biases in AI

algorithms require careful consideration. *(ref.: https://doi.org/10.3390/computation10070127)*

Business AI: AI in business involves the application of algorithms, machine learning models and data analytics to automate processes, optimise decision-making and improve operational efficiency. AI-driven business solutions can help with tasks such as customer relationship management, supply chain management, predictive analytics and fraud detection. By harnessing the power of AI, organisations can gain insights from large data sets, streamline operations and improve productivity, leading to better outcomes, increased competitiveness and innovation in the business landscape. *(ref.: https://doi.org/10.3390/ai1020011)*

Chatbot: A computer program designed to simulate conversation with human users, typically using natural language processing techniques. Chatbots can be used for various purposes, such as customer support, information retrieval, and personal assistants. *(ref.: https://doi.org/10.3390/ai4010015)*

Computer programming: The process of writing, designing, and creating instructions or programs that control the behaviour of a computer. AI plays an important role in computer programming by providing techniques and tools for developing intelligent systems, such as machine learning algorithms and data analysis frameworks. *(ref.: https://doi.org/10.3390/educsci13030322)*

Computer vision: An area of AI that focuses on enabling computers to understand and interpret visual information from images or video. Computer vision algorithms can perform tasks such as object recognition, image segmentation, and face recognition. AI techniques, including neural networks such as RNNs, can enhance the capabilities of computer vision systems, enabling advanced image understanding and analysis. *(ref.: https://doi.org/10.3390/ai3010014)*

Convolutional Neural Network (CNN): A type of neural network commonly used in computer vision. CNNs are designed to automatically and hierarchically learn visual patterns and features from images or video, enabling tasks such as object recognition and image classification. *(ref.: https://doi.org/10.3390/computation11030052)*

Cybersafety: Cybersafety in AI refers to measures taken to ensure the safe and responsible use of artificial intelligence technologies, including protecting individuals' privacy, preventing misuse, and mitigating harmful consequences associated with AI systems. *(ref.: https://doi.org/10.3390/info11100471)*

Cybersecurity: Cybersecurity in AI involves using artificial intelligence to protect computer systems, networks, and data from cyber threats and attacks. AI can enhance threat detection, automate responses, and improve overall security posture. *(ref.: ISBN 9781032414775)*

Database: Database in AI refers to structured collections of data used for storage, retrieval, and analysis. AI algorithms often rely on databases to access and process information, enabling tasks such as machine learning and natural language processing. *(ref. https://doi.org/10.3390/app112311365)*

Data Mining (Data Analysis and Mining): in AI involves the process of discovering patterns, insights, and trends within large datasets using machine learning and statistical techniques. It's essential for making informed decisions and predictions in various fields, including business, healthcare, and research. *(ref.: https://doi.org/10.3390/su15054026)*

Data Science: combines techniques from statistics, computer science, and domain expertise to extract valuable insights, build predictive models, and make data-driven decisions, often using AI and machine learning methods. *(ref.: https://doi.org/10.3390/bdcc4020013)*

Deep learning: A branch of machine learning that uses multi-layered artificial neural networks to learn and extract complex patterns and representations from data. Deep learning algorithms are particularly effective in tasks such as image and speech recognition. *(ref.: https://doi.org/10.3390/computers12050091)*

Data pre-processing: The process of preparing and transforming raw data into a format suitable for analysis. Data preprocessing includes steps such as cleaning, normalisation and feature selection to ensure data quality and improve the performance of AI models. *(ref.: https://doi.org/10.3390/data8040072)*

Education AI: In the context of AI, education encompasses the integration of AI technologies and methodologies into learning environments to enhance the teaching and learning experience. AI in education can include the use of intelligent tutoring systems, adaptive learning platforms and virtual reality simulations to personalise and optimise the learning process. It also includes the application of AI techniques for data analysis and assessment, enabling educators to gain insights into student performance and tailor teaching strategies accordingly. The integration of AI in education has the potential to improve educational outcomes, promote lifelong learning and prepare individuals for the evolving demands of the future. *(ref.: https://doi.org/10.3390/soc13050118)*

Ethics AI: Ethics in AI encompasses various considerations, including fairness, transparency, accountability, privacy and bias. It involves addressing ethical dilemmas related to the collection and use of data, algorithmic decision-making, and the potential impact of AI on individuals, society, and the environment. Ethical frameworks and guidelines are being developed to guide the development and use of AI in a responsible manner. These frameworks aim to ensure that AI systems respect human rights, avoid discrimination, promote fairness, protect privacy and uphold societal values. By integrating ethical considerations into the development and deployment of AI, we can strive for the responsible and beneficial use of AI, minimising potential harm and maximising the societal benefits of this transformative technology. *(ref.: https://doi.org/10.3390/ai4010003)*

Ergonomics and Human Factors AI: Into AI, ergonomics and human factors refers to the scientific study of how humans interact with AI systems, with a focus on optimising usability, performance, and safety. It includes the design and evaluation of AI interfaces, workflows and environments to ensure they are aligned with human capabilities, needs and preferences. Ergonomics and human factors consider various aspects such as user interface design, cognitive workload, task allocation and physical ergonomics. AI technologies can be

used to analyse user behaviour, collect feedback and adapt system interfaces to improve user experience and performance. By integrating the principles of ergonomics and human factors into the design of AI systems, developers can create interfaces and interactions that are intuitive, efficient and conducive to human well-being. This approach aims to minimise cognitive load, prevent errors and optimise the overall human-machine interaction in AI applications across multiple domains. *(ref.: https://doi.org/10.3390/su14041949)*

Feature extraction: The process of selecting and transforming relevant features from raw data to represent the underlying patterns or characteristics. Feature extraction helps reduce dimensionality and focuses on the most informative aspects of the data for AI model training. *(ref.: https://doi.org/10.3390/math9111227)*

Government AI: AI in government involves the use of algorithms, machine learning models, and data analytics to improve decision-making processes, optimise public services, and enhance policy formulation. Governments can use AI to analyse large amounts of data, identify patterns, and make data-driven decisions. AI applications in government include areas such as citizen services, public safety, healthcare management, transportation planning, and resource allocation. By integrating AI into government processes, governments can improve efficiency, transparency and responsiveness, leading to better service delivery and outcomes for citizens. *(ref.: https://doi.org/10.3390/su15064796)*

Healthcare AI: In the context of AI, healthcare refers to the application of artificial intelligence technologies and techniques to improve medical diagnosis, treatment, and patient care. AI in healthcare involves the use of algorithms and machine learning models to analyse medical data, such as patient records, imaging scans, and genetic information, to aid in disease detection, personalised medicine, and clinical decision-making. AI-powered healthcare solutions have the potential to improve the efficiency, accuracy and accessibility of healthcare delivery, leading to better patient outcomes and health outcomes on a larger scale. *(ref.: https://doi.org/10.3390/su142416464)*

HEDY Toolkit Videos: A collection of instructional videos provided in the HEDY Toolkit that introduce various AI concepts, examples, tools and techniques. These videos provide step-by-step guidance and practical demonstrations to help users understand and effectively apply AI principles. *(ref.: https://doi.org/10.3390/su15065596 & https://lifeintheaiera.eu/2023/02/24/hedy-toolkit)*

HEDY MOOC: The HEDY MOOC (Massive Open Online Course) is an innovative educational platform offering comprehensive learning opportunities in the field of Artificial Intelligence (AI). Developed as part of the Life in the AI Era project, the HEDY MOOC aims to enrich individuals' skills and deepen their understanding of AI and its societal implications. Through a combination of engaging lectures, interactive activities and expert-led discussions, the HEDY MOOC is aimed at a wide range of participants, including lecturers, students and professionals seeking professional development. The MOOC covers several AI-related topics, including machine learning, computer vision, natural language processing, and ethics in AI. By providing accessible and high-quality education, the HEDY MOOC empowers learners to navigate the complexities of the AI era and contribute to the responsible development and

use of AI technologies. *(ref.: https://lifeintheaiera.eu/2023/02/24/life-in-the-ai-era-hedy-mooc)*

Hybrid Intelligence: Hybrid Intelligence signifies a collaboration between human factors and artificial intelligence (AI). It emphasizes the harmonious interaction of human capabilities, such as intuition and creativity, with AI's data-driven processing power. In this partnership, humans and AI complement each other's strengths, working together in decision-making, problem-solving, and task execution across diverse applications. *(ref.: https://doi.org/10.3390/app13042198)*

Hyperparameters: Hyperparameters in AI are settings or configurations that control the behavior and performance of machine learning algorithms. They are set before training and can significantly impact the model's effectiveness. *(ref.: https://doi.org/10.3390/informatics8040079)*

Industry 4.0 & Society 4.0 AI: Both Industry 4.0 and Society 4.0 highlight the transformative power of AI in reshaping industries and societies. They emphasise the integration of AI technologies across sectors to drive innovation, productivity and societal progress. These concepts underline the importance of preparing individuals, organisations and policies for the opportunities and challenges of the AI-driven future. *(ref.: https://doi.org/10.3390/app13031903)*

Image & Video Recognition: Image Recognition in AI is the ability of machines to identify objects, patterns, or features within images and videos, often using deep learning techniques like convolutional neural networks. It has numerous applications, from facial recognition to autonomous vehicles. *(ref.: https://doi.org/10.3390/books978-3-0365-1591-5)*

Industry 5.0 & Society 5.0 AI: Both Industry 5.0 and Society 5.0 emphasise the evolving relationship between humans and AI, and the need for a human-centred approach to technology development and deployment. These concepts envision a future where AI is not just a tool for automation, but a powerful force for positive change, empowering individuals and communities to thrive in a rapidly changing world. *(ref.: https://doi.org/10.3390/pr11051318)*

Inference: The process where a trained machine learning model applies its learned knowledge to make predictions or decisions based on new data. It's a crucial step in using AI models for real-world applications. *(ref.: https://doi.org/10.3390/info8020061)*

Information true & real: In the context of AI, "true" and "real" refer to the authenticity and fidelity of data, models, or representations used in AI systems. They emphasize the importance of accuracy, reliability, and fidelity to reality in AI applications. "True" data accurately represents the real-world information it aims to capture, free from errors, biases, or distortions. AI models trained on real data are more likely to produce accurate results. Similarly, "real" outputs or representations from an AI system closely match actual or expected outcomes in the real world. Achieving realism in AI involves sophisticated algorithms, advanced machine learning techniques, and accurate representations of the underlying phenomena. Using true and real data and models is crucial for developing trustworthy and effective AI systems, reducing the risk of biased or misleading results, and

enhancing the reliability and credibility of AI applications in various domains. *(ref.: https://doi.org/10.3390/journalmedia4020043)*

Information false & disinformation: In the context of AI, "false" and "disinformation" refer to intentionally disseminated or generated inaccurate and misleading information. False information is deliberately created or manipulated to deceive others, while disinformation involves the deliberate spreading of false information to influence public opinion. AI technologies play a dual role in addressing this issue, as they can be used both to detect and flag false content and to generate more sophisticated forms of deception. Efforts are being made to develop AI systems and algorithms that can effectively combat false and disinformation, promoting a more trustworthy information ecosystem. *(ref.: https://doi.org/10.3390/app12157725)*

Internet of Things (IoT): IoT is the network of interconnected physical devices, vehicles, appliances, and other objects embedded with sensors, software, and connectivity, allowing them to collect and exchange data. AI is often used to analyze and derive insights from this data, enhancing IoT's functionality. *(ref.: https://doi.org/10.3390/en16083465)*

Knowledge Graph: This is a structured database that represents knowledge in a graph-like format, with interconnected nodes and edges. It's used to model relationships and facts, enabling AI systems to understand and reason about complex information. *(ref.: https://doi.org/10.3390/info13080396)*

Labour market AI: AI technologies can automate repetitive and routine tasks, leading to changes in job roles and the displacement of certain types of work. This automation effect can create both challenges and opportunities in the labour market. While some jobs may become obsolete, new roles and skill requirements will emerge, requiring workers to adapt and acquire new skills. *(ref.: https://doi.org/10.3390/jtaer16070156)*

Language Model: Language Model in AI is a system or algorithm that processes and generates human language text. It's used for tasks like text generation, translation, and sentiment analysis, and it's a core component of natural language processing (NLP) applications. *(ref.: https://doi.org/10.3390/fi15080260)*

Large Language Models (LLM): Large Language Models in AI are sophisticated neural network-based models with massive amounts of parameters, capable of understanding and generating human-like text. They have revolutionized natural language processing tasks, such as translation, question-answering, and content generation, but also raise concerns regarding biases and ethical usage. *(ref.: https://doi.org/10.3390/info14070418)*

Logistics AI: AI technologies have a critical role in improving the efficiency, accuracy and decision-making of logistics operations. Through advanced algorithms, machine learning and data analytics, AI can optimise route planning, inventory management, demand forecasting and delivery scheduling. By using AI in logistics, organisations can streamline operations, reduce costs, improve customer satisfaction, and respond effectively to changing market demands. The application of AI in logistics has significant potential to improve supply chain performance and revolutionise the transportation industry. *(ref.: https://doi.org/10.3390/foods12081654)*

Machine learning: A branch of AI that enables computers to learn and improve from experience without being explicitly programmed. Machine learning algorithms analyse data and identify patterns, allowing the system to make predictions or decisions. *(ref.: https://doi.org/10.3390/app13095438)*

Metadata: Metadata in AI refers to data that provides information about other data. It includes details like data source, format, creation date, and authorship. Metadata helps AI systems organize, understand, and manage large datasets efficiently. *https://doi.org/10.3390/info14080427*

Military AI: AI has the potential to revolutionise military capabilities by enabling autonomous systems, advanced analytics and decision-making algorithms. Military applications of AI include autonomous drones for surveillance and reconnaissance, intelligent target tracking and identification systems, predictive analytics for strategic planning, and cybersecurity defences. AI can improve situational awareness, speed up decision-making and optimise resource allocation in military operations. However, the use of AI in the military also raises important ethical and security considerations, such as ensuring human oversight, preventing unintended consequences, and addressing the potential risks associated with autonomous weapons systems. *(ref.: https://doi.org/10.3390/electronics10070871)*

MOOC: Short for Massive Open Online Course, a web-based course designed to be accessible to a large number of learners at the same time. MOOCs offer interactive content, assessments and collaboration opportunities, often covering a wide range of topics. *(ref.: https://doi.org/10.3390/su141811199 & https://lifeintheaiera.eu/2023/02/24/life-in-the-ai-era-hedy-mooc)*

Natural language processing (NLP): The branch of AI that focuses on the interaction between computers and human language. NLP enables machines to understand, interpret and generate human language, facilitating tasks such as language translation and sentiment analysis. *(ref.: https://doi.org/10.3390/app12189207)*

Neural Architecture Search (NAS): Neural Architecture Search in AI is a technique that uses automated algorithms or machine learning to find optimal neural network architectures for specific tasks. It aims to streamline the process of designing neural networks, improving their efficiency and effectiveness. (*ref.: https://doi.org/10.3390/app11188628)*

Neural network: A computational model inspired by the structure and function of the human brain. Neural networks consist of interconnected artificial neurons that process and transmit information, enabling the system to learn and make predictions. *(ref.: https://doi.org/10.3390/fintech2010010)*

OpenAI: OpenAI is an organization dedicated to advancing artificial intelligence research and development while promoting openness and collaboration in the field. (ref.: *https://doi.org/10.3390/systems11030120*)

Open Data: Open Data in AI refers to publicly accessible data that can be freely used, shared, and analyzed by individuals, organizations, or AI systems. It promotes transparency,

innovation, and collaboration in AI research and applications. *(ref.: https://doi.org/10.3390/su10020545)*

People and Lifestyle AI: AI algorithms and systems can be used to analyse and understand human behaviour, preferences and patterns, enabling personalised experiences and recommendations in areas such as entertainment, shopping, travel and social interactions. By leveraging machine learning and data analytics, AI can help predict and adapt to individual needs, optimise resource allocation, and provide tailored solutions that suit specific lifestyles. In addition, AI-powered virtual assistants and chatbots can facilitate seamless and intelligent interactions, providing convenience and support in managing tasks, accessing information and engaging with digital services. The integration of AI into people's lives and lifestyles has the potential to improve productivity, convenience and overall wellbeing, but also raises considerations around privacy, data protection and the ethical use of personal information. *(ref.: https://doi.org/10.3390/app122312467)*

Personal Data: Personal Data in AI refers to any information that can identify an individual, such as their name, address, or biometric details. Protecting personal data is crucial for privacy and ethical AI use. *(ref.: https://doi.org/10.3390/s23031477)*

Personal Data Processing: Involves the collection, storage, and manipulation of individuals' personal information. It's subject to data protection regulations, and responsible handling is essential to safeguard privacy. *(ref.: https://doi.org/10.3390/info11020117)*

Pre-trained Models. They are neural network models that have been trained on large datasets for specific tasks, such as image recognition or natural language understanding. They serve as a foundation for fine-tuning on smaller, task-specific datasets, enabling faster and more efficient AI development. *(ref.: https://doi.org/10.3390/s23136227)*

Programming languages: They are formal languages that allow people to communicate instructions to computers. They provide a set of rules and syntax that programmers use to write code that is then compiled or interpreted by a computer to perform specific tasks. By bridging the gap between human understanding and machine execution, programming languages enable the development of a wide range of software applications and systems. *(ref.: https://doi.org/10.3390/app10238521)*

Projects: Projects in the context of AI refer to specific undertakings or initiatives that involve the development, implementation, or research of artificial intelligence applications. These projects can vary widely in scope and purpose, from building AI-powered chatbots to conducting AI research studies. *(ref.: https://lifeintheaiera.eu/)*

Popular Programme languages: "Python" is the one of the most popular and versatile programming language for AI development, with extensive support for AI frameworks and libraries. "R" is widely used in statistical analysis and data science, offering packages for AI tasks. "Java" is chosen for enterprise-grade AI applications, while "C++" excels in speed and efficiency for computer vision and robotics. "MATLAB" is preferred for numerical computing and visualization. "Julia" provides fast execution and integration with other languages. "Scala" is suitable for big data processing and distributed computing. The

choice depends on project goals and requirements. *(ref.: https://doi.org/10.3390/info11040193)*

Profiling: the practice of gathering and analyzing data about individuals or groups to create behavioral or demographic profiles. This information is often used to make predictions, tailor content, or target advertisements. However, it raises concerns about privacy and potential misuse of personal data. *(ref. https://doi.org/10.3390/app13106201)*

Pseudonymisation: This is a data protection technique that replaces identifying information with pseudonyms or codes, making it harder to link data to individuals. It helps enhance privacy and security when handling sensitive data in AI applications. *(ref. https://doi.org/10.3390/app12094413)*

Quantum Computing: Quantum Computing in AI refers to using quantum computers, which leverage the principles of quantum mechanics, to perform computations that are significantly faster than classical computers. Quantum computing holds the potential to revolutionize AI by tackling complex problems, like optimization and cryptography, more efficiently. *(ref.: https://doi.org/10.3390/quantum5030039)*

Quantum Machine Learning: Quantum Machine Learning in AI involves using quantum computing to enhance machine learning algorithms. It explores how quantum properties like superposition and entanglement can speed up data processing, enabling AI systems to solve certain problems much faster than classical computers. *(ref.: https://doi.org/10.3390/electronics12112379)*

Recommender Systems: They are algorithms that analyze user preferences and behavior to provide personalized recommendations, such as product suggestions on e-commerce platforms or content recommendations on streaming services. They enhance user experience and drive engagement. *(ref.: https://doi.org/10.3390/app13095531)*

Reinforcement learning: A type of machine learning in which an agent learns to interact with an environment and improve its performance through trial and error. The agent receives feedback in the form of rewards or penalties to guide its decision making. *(ref.: https://doi.org/10.3390/mi13111887)*

Sentiment Analysis: Sentiment Analysis in AI involves using natural language processing to determine the emotional tone or sentiment expressed in text, such as positive, negative, or neutral. It's used for understanding public opinion, customer feedback, and social media trends. *(ref.: https://doi.org/10.3390/computers12020037)*

Skills & competencies AI: The development of skills and competences in AI is crucial for individuals wishing to work in AI-related fields, for organisations wishing to adopt AI technologies, and for society at large. It facilitates innovation, drives economic growth and ensures responsible and ethical AI practices. Continuous learning and upskilling are essential to keep pace with the rapid advances in AI and to harness its potential for positive impact in various sectors, including healthcare, finance, transportation, and more. *(ref.: https://doi.org/10.3390/computers12040072)*

Smart City: Smart City refers to an urban environment that uses AI and other advanced technologies to improve the quality of life for its residents and optimise resource

management. It involves the integration of various data-driven systems such as sensors, Internet of Things (IoT) devices, and AI algorithms to improve urban infrastructure, transportation, energy efficiency, public safety, and more. AI plays a critical role in analysing vast amounts of data collected from various sources to derive actionable insights and enable intelligent decision-making for efficient city operations. The concept of a smart city aims to create sustainable, connected and citizen-centric urban environments that harness the potential of AI for innovation and improvement. *(ref.: https://doi.org/10.3390/su14020620)*

Supervised learning: A type of machine learning where the algorithm learns from labelled training data where the correct answers or outcomes are provided. The algorithm generalises from the labelled data to make predictions or decisions on unseen data. *(ref.: https://doi.org/10.3390/math10060915)*

Sustainability: Sustainability in the context of AI refers to developing and using artificial intelligence technologies in ways that minimize their environmental impact, promote energy efficiency, and consider the long-term ecological consequences of AI systems. *(ref.: https://doi.org/10.3390/su151813493)*

Sustainable Development Goals (SDGs): Sustainable Development Goals in the context of AI are a set of global objectives established by the United Nations to address social, economic, and environmental challenges. AI is leveraged to help achieve these goals by providing data-driven insights and innovative solutions to pressing global issues like poverty, healthcare, and climate change. *(ref.: https://doi.org/10.3390/su13041738)*

Swarm Intelligence: Swarm Intelligence in AI is a problem-solving technique inspired by the collective behavior of social organisms, where multiple agents (e.g., robots or algorithms) work together to solve complex problems, often used for optimization and decision-making. *(ref.: https://doi.org/10.3390/bdcc5030036)*

Symbolic: In AI involves using symbolic representations and rules to model and reason about the world. It focuses on manipulating symbols to perform tasks like logical reasoning and knowledge representation. *(ref.: https://doi.org/10.3390/computers10110154)*

Text Analytics in AI: Text Analytics (also known as text mining / text data mining) is the process of extracting meaningful insights, patterns, and information from unstructured text data. It includes tasks like text classification, sentiment analysis, and entity recognition, aiding in data understanding and decision-making. *(ref.: https://doi.org/10.3390/math10234398)*

Text Summarization in AI: This is the process of condensing a longer text into a shorter version while retaining its key information and meaning. It's used for creating concise summaries of documents, articles, or other text sources. *(ref.: https://doi.org/10.3390/info14090472)*

Thesauri: Thesauri in AI are structured vocabularies or databases that store synonyms and related words, enabling natural language processing systems to improve language understanding and text analysis by identifying similar or equivalent terms. *(ref.: https://doi.org/10.3390/encyclopedia1010015)*

Tracking: The process of locating and following the movement of objects or subjects in a given space. In the context of AI, tracking algorithms use various techniques, such as computer vision and machine learning, to track objects in video or real-time camera feeds. AI-based tracking systems can be used in areas such as surveillance, robotics and autonomous vehicles. *(ref.: https://doi.org/10.3390/pr11020312)*

Transport AI: AI can play a crucial role in improving various aspects of transport, including efficiency, safety and sustainability. Through the use of advanced algorithms, machine learning and sensor technologies, AI can improve traffic management systems, optimise route planning and scheduling, and enable autonomous vehicles. AI-powered systems can analyse real-time data from multiple sources, such as sensors, cameras, and satellite imagery, to monitor and predict traffic conditions, identify congestion patterns, and make intelligent decisions to optimise traffic flow. In addition, AI can contribute to the development of intelligent transport systems, including smart infrastructure, connected vehicles and collaborative mobility platforms. Through the use of AI in transport, we can envision a future with reduced congestion, improved safety, and more sustainable and efficient mobility solutions. However, the widespread adoption of AI in transport also raises important considerations related to privacy, cybersecurity, and ethical decision-making algorithms. *(ref.: https://doi.org/10.3390/su11010189)*

Training Data in AI: Refers to the dataset used to teach machine learning models how to perform a specific task. It serves as the basis for model learning and helps it make predictions or classifications when exposed to new data. *(ref.: https://doi.org/10.3390/jpm11010032)*

Transfer Learning in AI: This is a technique where a pre-trained model's knowledge and parameters are used as a starting point for a new, related task. It accelerates model training and improves performance in various applications. *(ref.: https://doi.org/10.3390/electronics12153327)*

Triplet Relations in AI: Involve sets of three data points used in machine learning for tasks like similarity learning. It typically includes an anchor, a positive example, and a negative example, helping models learn to distinguish between similar and dissimilar instances. *(ref.: https://doi.org/10.3390/math11122661)*

Unsupervised learning: A type of machine learning in which the algorithm learns from unlabelled data, identifying patterns and structures within the data without specific guidance. Unsupervised learning is useful for tasks such as clustering and dimensionality reduction. *(ref.: https://doi.org/10.3390/math10214043)*

Virtual Reality (VR): A computer-generated simulation of a three-dimensional environment that a user can interact with and explore. VR technology creates an immersive and realistic experience and is often used for training, education and entertainment. AI techniques can be used in VR systems to enhance user interaction and create intelligent virtual environments. *(ref.: https://doi.org/10.3390/healthcare10112261)*

Word Embeddings in AI: Word Embeddings are numerical representations of words or phrases in vector form. These representations capture semantic relationships between

words and are used in natural language processing tasks like text classification and language generation. *(ref.: https://doi.org/10.3390/app12178805)*

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