



AI4VET4AI
AI-powered next generation of VET



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D4.2: Curricula for IVET and CVET teacher training on AI-related skills

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DISSEMINATION LEVEL

PU	Public, fully open	X
SEN	Sensitive (limited under the GA conditions)	
CLAS S	EU classified, confidential	

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Executive Summary

This deliverable (D4.2) presents a structured and comprehensive set of teacher training curricula focused on AI-related skills, developed for educators in IVET and CVET systems. As part of the AI4VET4AI project's broader mission to modernize vocational education and strengthen the responsiveness of VET ecosystems to the demands of AI-driven labour markets, the teacher curricula support the upskilling and reskilling of educators who are expected to deliver new, AI-enriched learning experiences.

The curricula were developed in close alignment with the learner-oriented content from Task 4.1, ensuring consistency in learning objectives, AI concepts, and ethical foundations. However, the teacher training curricula also go further by integrating pedagogical strategies, instructional design, and assessment methodologies tailored to adult learning and professional development.

A total of ten teacher training courses were designed, each corresponding to one of the learner curricula topics:

- Customer Relationship Management with AI
- AI in Tourism and Sustainability
- AI for Process Automation and Personalized Learning
- Human-AI Collaboration in Education
- Synthetic Patient Records and Medical AI
- AI for Doctor-Patient Interaction
- AI in Personalized Advertising
- AI for Market Research
- AI in Customer Service
- AI in Logistics and Inventory Automation

Each curriculum is modular, practical, and adaptable for different VET environments. The training emphasizes active learning, including workshops, case studies, simulations, and real-world tool use. At the same time, the courses ensure that teachers understand the ethical, legal, and pedagogical responsibilities of using AI in the classroom, particularly in light of the EU AI Act, GDPR, and principles of trustworthy AI.

Educators are trained to deliver both technical and transversal skills. They are guided in the use of AI tools (e.g. chatbots, NLP, analytics platforms), but also in how to facilitate ethical discussions, differentiate instruction, and foster inclusive and learner-centered environments.

Throughout the development process, the AI4VET4AI consortium followed a participatory model, where partners collaborated in working groups aligned to their areas of expertise and interest. Feedback loops, internal reviews, and shared templates ensured that each curriculum met high pedagogical standards and remained relevant to industry and educational policy needs.

This deliverable supports one of the project's core objectives: empowering VET educators to be not only deliverers of knowledge but also agents of digital and pedagogical innovation. The curricula presented here provide a replicable foundation for national training programs, teacher CPD pathways, and future integration into MOOC and blended learning formats across Europe.

1. Introduction

The integration of Artificial Intelligence into education and training systems is not only a technological evolution but also a profound pedagogical shift. For this transformation to take root and deliver long-term value, educators — particularly those working in IVET and CVET systems — must be equipped with the knowledge, tools, and confidence to teach AI-related skills effectively. Task 4.2 of the AI4VET4AI project directly addresses this challenge by creating tailored curricula for teacher training.

Following the identification of ten key AI-focused learner curricula under Task 4.1, this task focused on creating corresponding teacher training versions. These courses are not mere replications of learner content. Instead, they are comprehensive training programs that guide teachers through:

- Mastering the technical content in each AI topic
- Adopting pedagogical methods suitable for AI teaching
- Addressing ethical and legal implications of AI in education
- Designing assessments and learning environments that reflect the complexity and diversity of AI-enhanced learning

The development process mirrored that of Task 4.1. Working groups were composed based on partners' domain and pedagogical expertise, and lead institutions were selected to coordinate course development. The templates used ensured consistency in terms of structure: learning outcomes, key competencies, instructional approaches, and recommended tools were all standardized across courses.

Importantly, the teacher curricula take into account the dual role of VET educators: they must transfer knowledge while also fostering learners' capacity to reflect critically, solve problems creatively, and adapt to evolving technologies. As such, the training programs emphasize:

- Practical tool use (e.g. TensorFlow, IBM Watson, generative AI, learning analytics platforms)
- Ethical instruction (e.g. teaching bias detection, privacy considerations, fairness in AI systems)
- Instructional design (e.g. using PBL, simulations, hybrid learning models)
- Adaptability and inclusion (e.g. addressing different learner profiles, cultural and language challenges)

Each course starts with a foundational unit on the basics of AI — not only so that educators understand the content but also so that they are equipped to explain it accessibly to learners at various levels. This shared foundation ensures coherence across all training programs.

Throughout the development phase, the consortium maintained a strong focus on practical applicability. Teachers are not only trained on how to *use* AI in their own teaching (e.g. for grading or recommendation systems) but also on how to *teach about* AI responsibly. This includes guidance on selecting datasets, demonstrating algorithmic decision-making, and facilitating classroom discussions on AI's societal impact.

This dual focus — pedagogy and content — ensures that the teacher training curricula can be readily integrated into national professional development programs and institutional CPD frameworks. They are designed for flexibility, allowing for adaptation to regional contexts and institutional goals, while still preserving the EU-wide emphasis on ethics, inclusion, and technological fluency.

Ultimately, the purpose of these curricula is to empower educators to act as AI facilitators in their classrooms and institutions — not only capable of teaching current tools, but also equipped to adapt to the evolving AI landscape.

2. Curricula summaries

2.1 Customer Relationship Management – using AI to provide better service to customers

This teacher training course is designed to equip educators with the skills and knowledge needed to effectively teach AI-enhanced Customer Relationship Management (CRM) to IVET students in the hospitality industry. It focuses on both technical content and pedagogical strategies, enabling teachers to guide students through topics such as data-driven CRM, AI tools for personalization, sentiment analysis, and ethical AI usage. The course comprises nine units that cover fundamental CRM principles, AI integration in hospitality, data collection and predictive modelling, and implementation of recommendation engines and chatbots. Teachers are trained to use Project-Based Learning (PBL) and case studies to foster student engagement and practical understanding. Emphasis is also placed on preparing educators to teach about privacy regulations like GDPR, and to develop instructional methods that balance technological innovation with ethical considerations. Upon completion, teachers will be able to confidently deliver CRM + AI content, create effective assessments, and support students in applying AI to real-world customer service challenges.

2.2 Using AI for Understanding Tourism Impact and Improving Sustainability

This teacher training course equips educators with the skills to teach how Artificial Intelligence (AI) supports sustainable development in the tourism and hospitality sector. Teachers learn pedagogical strategies to introduce AI applications across social, environmental, and economic dimensions of tourism, enabling students to assess tourism impact and optimize operations. The course is structured around three main modules: fundamentals of AI in tourism, AI for business decision-making, and sustainable tourism strategies with AI. Educators will explore how to teach impact assessment, data-driven personalization, resource management, and the use of AI for community and environmental sustainability. Through hands-on activities, real-world case studies, and teaching material development, teachers gain confidence in creating engaging, student-centered lessons. Upon completion, they are equipped to guide students in applying AI to improve both the efficiency and responsibility of tourism practices.

2.3 Using AI for Process Automation in Teaching and for Creating Personalised Recommendations for Learners

This teacher training course introduces educators to the foundational and practical applications of Artificial Intelligence (AI) in personalising learning and automating educational processes. The course equips teachers with the skills to use AI tools for customizing learning paths, providing individualized feedback, and supporting student self-management. Through three comprehensive modules, educators explore AI fundamentals, ethical

considerations, personalised learning strategies, time management tools, and collaborative learning enhancements. They also learn to integrate gamification, foster problem-solving using AI data tools, and anticipate how AI shapes professional development and future careers. With a balance of hands-on labs, real-world use cases, and interactive discussions, the course enables teachers to apply AI solutions ethically and effectively within diverse classroom settings. Upon completion, educators will be prepared to guide learners in using AI for academic improvement, time management, and career readiness in an AI-driven world.

2.4 Human-AI Collaboration in Teaching and Learning

This teacher training course equips educators to teach the Human-AI Collaboration curriculum effectively in both IVET and CVET environments. It emphasizes pedagogical strategies for introducing AI in educational contexts, with a focus on clear communication, adaptability, and ethical awareness. Teachers are trained to deliver lessons using AI-powered educational tools, create tailored assessments, and adapt content to diverse learner needs. The course includes modules on teaching AI fundamentals, facilitating ethical discussions, and applying AI in different educational sectors. Through case studies, technical demonstrations, and collaborative lesson planning, educators gain practical experience in integrating AI into classroom practices. By the end, teachers will be able to confidently demonstrate AI tools, design inclusive assessments, and foster critical discussions on the ethical dimensions of AI in learning.

2.5 Synthetic Patient Records – How and Why?

This teacher training course is designed to help educators integrate Artificial Intelligence and synthetic data into healthcare education. It explores the transformative role of AI in the health sector, particularly focusing on synthetic data as a safe, ethical, and practical alternative to real patient records. Through real-world case studies, educators will learn to apply AI tools, analyze ethical and regulatory implications, and generate synthetic data for use in teaching. The course also provides deep insights into EU frameworks like the AI Act, MDR, and IVDR, preparing teachers to keep pace with legal developments. Participants will develop competencies in lesson planning, prompt engineering, data management, and visualization using open-source tools. By the end of the course, teachers will be equipped to create and deliver AI-augmented, regulation-compliant content in health education settings, fostering innovation while ensuring ethical and privacy standards are upheld.

2.6 Enhancing Doctor-Patient Interactions with AI

This course prepares educators to teach how AI technologies can support and improve doctor-patient interactions by addressing communication barriers, ethical challenges, and patient adherence. It explores socio-cultural and systemic obstacles in healthcare communication and introduces AI tools such as NLP-based chatbots, clinical decision support systems, and generative AI for medical visuals. Teachers are equipped to guide learners in applying AI for multilingual communication, personalized patient education, and ethical use of patient data. Case studies and practical examples illustrate how AI can be responsibly integrated to enhance empathy, understanding, and

adherence in healthcare settings. The course also emphasizes teaching strategies for fostering trust in AI, developing interdisciplinary collaborations, and designing AI-informed communication scenarios. By the end, educators can deliver comprehensive, real-world lessons that blend AI capabilities with human-centric care principles.

2.7 Using AI for Personalized Advertising Campaigns

This course prepares educators to teach how AI transforms advertising by enabling highly personalized, data-driven campaigns. It covers theoretical foundations, practical tools, and real-world case studies, helping teachers support students in applying AI to improve customer engagement and campaign performance. Teachers will learn to introduce students to AI-powered advertising platforms, tools for content personalization, and legal and ethical frameworks, including GDPR compliance and bias prevention. Through modules on customer journey mapping, personalization strategies, and predictive modelling with generative AI, educators gain the skills to teach dynamic, omnichannel communication techniques. The course emphasizes hands-on learning using hybrid AI approaches with tools from Google, Meta, and Microsoft. Upon completion, teachers can guide learners in designing effective, ethical, and innovative AI-driven marketing campaigns.

2.8 AI in Market Research

This course equips educators with the knowledge and tools to teach how AI transforms market research through enhanced data analysis, trend identification, and consumer insight generation. It begins with foundational AI concepts, introducing key techniques such as machine learning, sentiment analysis, and predictive modelling in the context of marketing. Educators explore hands-on tools, including data visualization and NLP applications, and learn how to use various data types—qualitative, quantitative, and unstructured—to draw meaningful conclusions. The curriculum places strong emphasis on ethics, transparency, and data protection, particularly GDPR compliance, through real-world case studies. Teachers are trained to develop adaptable lesson plans and collaborative, project-based classroom activities that foster critical thinking and digital citizenship. By the end of the course, educators will confidently design, teach, and assess AI-driven market research content, preparing students for real-world marketing challenges and ethical decision-making.

2.9 AI in Customer Service – Use of Chatbots / Virtual Assistants and Personalised Suggestions

This course prepares teachers to instruct IVET and CVET learners on the implementation of AI in customer service environments. It focuses on the application of chatbots, virtual assistants, and recommendation algorithms within retail and service contexts. Educators explore key AI tools such as TensorFlow, SAP, and Prsync, while also learning to facilitate hands-on exercises in chatbot development, machine learning, and customer data analysis. Ethical considerations and personalization strategies are emphasized, ensuring students understand how to apply AI responsibly. Case studies from companies like Amazon and Sephora are used to illustrate real-world AI implementations. By the end, teachers can confidently design and deliver engaging lessons, guide learners through



AI-powered customer engagement projects, and evaluate the effectiveness of AI systems using real performance metrics.

2.10 AI-Driven Inventory and Logistics Automation

This course equips educators with the skills to teach how AI technologies transform inventory and logistics processes, especially in the wholesale and retail trade sectors. Teachers learn to guide students through foundational concepts such as machine learning for demand forecasting, data pipelines, and AI-powered decision-making in supply chains. The course includes modules on integrating AI with both proprietary and open-source systems, securing digital transactions, and analyzing real-world case studies. Educators are trained in hands-on workshops, problem-based learning, and simulations to effectively deliver content on optimizing stock levels, reducing costs, and improving visibility across the supply chain. Upon completion, teachers will be able to lead students in applying AI tools to real business scenarios, prepare them for digital transformation, and promote ethical AI usage in logistics and inventory environments.

3. Conclusion

The development of AI-related teacher training curricula under Task 4.2 represents a critical step toward embedding AI competency within Europe's VET ecosystems. As VET institutions evolve to meet the demands of a digital economy, the role of educators as agents of innovation, ethical reflection, and instructional leadership becomes increasingly vital.

This deliverable offers ten detailed, modular, and pedagogically robust training programs tailored to the real needs of teachers in the IVET and CVET systems. By linking each curriculum to a corresponding learner course, the project ensures vertical alignment between what students learn and how teachers deliver it. This coherence is essential for scalability and long-term integration into institutional and policy frameworks.

A notable strength of the curricula is their emphasis on pedagogical innovation. Teachers are trained not only in AI content but also in how to adapt their teaching methods to AI-enhanced environments. This includes preparing educators to:

- Design AI-integrated lesson plans
- Guide learners in using AI tools
- Foster critical thinking about AI impacts
- Incorporate ethical principles into instruction
- Leverage AI for inclusive and differentiated learning

Another major contribution is the operational flexibility of the curricula. These courses are designed to be delivered in face-to-face, blended, or fully online formats. They can be implemented as part of national teacher training programs, institutional CPD initiatives, or pan-European MOOCs.

Crucially, the curricula align with EU-level priorities, including the Digital Education Action Plan, the Pact for Skills, and the AI Act. They help ensure that European educators are not passive recipients of AI technologies but active participants in shaping how AI is introduced, discussed, and applied in education.

The collaborative process behind these curricula also underscores the importance of multi-stakeholder involvement. Partners with expertise in pedagogy, industry, ethics, and policy contributed to the course designs, ensuring that the resulting programs reflect both educational rigor and practical relevance.

In conclusion, the teacher training curricula presented in this deliverable are both timely and future-ready. They respond to the immediate need for AI capacity-building in education while laying the foundation for long-term transformation. By empowering teachers with these skills and tools, the AI4VET4AI project strengthens the entire VET system's ability to navigate — and lead in — the age of artificial intelligence.

4. Annex

4.1 Training Teachers to Deliver Customer Relationship Management with AI

COURSE SYLLABUS							
Course title:		Training Teachers to Deliver Customer Relationship Management with AI					
Study program and level		Study field		Academic / school year		Semester	
Teacher training		/		2.,3.		4.,6.	
Course type							
Teacher Professional Development							
University / school course code:							
Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECT S	
4 h	4 h	4 h			12 h	1	
Lecturer:							
Language of the Lectures:		English/ national language					

	Language of the Tutorial:	English/ national language
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Prerequisites:

Basic digital literacy and understanding of hospitality industry concepts. Teaching experience is preferred but not required.

Content (Syllabus outline):

This teacher training course prepares educators to deliver instruction on using artificial intelligence (AI) to improve customer relationship management (CRM) for IVET students in accommodation and hospitality. Teachers will develop both content knowledge and pedagogical approaches needed to effectively teach the fundamentals of CRM and AI. Special emphasis is placed on helping teachers facilitate students' understanding of high-quality data collection, AI applications for CRM tasks, and advanced analytics including sentiment analysis. Teachers will learn to implement case studies and Project-Based Learning (PBL) methodologies to develop students' competences in AI tools for CRM. The course also covers approaches to teaching ethical and secure implementation of these technologies.

The course is consisting of the following units:

- **Unit 1: Principles of CRM and Introduction to AI for Teachers**

This unit provides teachers with foundational knowledge in CRM elements and AI basics necessary to effectively instruct IVET students. Teachers will master the key principles of customer-centric strategies, CRM processes, and the importance of relationship building in business success. The unit includes pedagogical approaches to present CRM strategies and technologies from the data management perspective and introduces teachers to appropriate instructional methods for explaining AI concepts to beginners.

- **Unit 2: Teaching AI Integration in Hospitality**

This unit equips teachers with resources and pedagogical strategies to demonstrate AI applications in hospitality contexts. Teachers will gain competence in showcasing how AI enhances CRM through process automation, data analysis insights, and personalized customer experiences. The unit covers instructional techniques for helping students understand how AI in hospitality optimizes operations, improves guest experiences, and increases efficiency in accommodation and food services. Teachers will develop skills to facilitate student exploration of real-world applications of AI-driven CRM solutions.

- **Unit 3: Teaching Privacy, Security, and Ethics**

This unit prepares teachers to educate students about data protection laws like GDPR, strategies for securing customer data, and ethical considerations in using AI for CRM. Teachers will learn methodologies for helping students understand the balance between technological advancement and privacy concerns. The unit includes approaches to teaching about customers' synthetic microdata while maintaining appropriate ethical frameworks.

– **Unit 4: Teaching Data Collection Techniques**

This unit develops teachers' abilities to instruct students on various data collection methods relevant to CRM, including surveys, transactional data analysis, and social media analytics. Teachers will learn effective strategies for demonstrating these methods as components of the CRM data management process. The unit covers pedagogical approaches to teaching data organization and storage for efficient retrieval and analysis.

– **Unit 5: AI in Predictive Modelling**

This unit prepares teachers to facilitate student understanding of predictive modelling potentials in CRM. Teachers will develop skills to guide students through customer dataset exploration, feature selection, customer segmentation, and making predictions for future actions. The unit covers instructional techniques for explaining linear regression models to help students realize that AI models can be simple and explainable.

– **Unit 6: Teaching Customization of Customer Experiences**

This unit develops teachers' ability to instruct students on using AI for creating unique customer experiences that increase loyalty and engagement. Teachers will learn approaches for reviewing data collection methods related to customer experience, including surveys and social media monitoring. The unit covers strategies for guiding students to explore AI tools for customizing customer experiences and building instructional activities around these concepts.

– **Unit 7: Teaching Automated Customer Interaction**

This unit equips teachers with the knowledge and skills to help students explore preconditions and potentials of AI tools for automated customer interaction. Teachers will develop strategies for facilitating discussions on the role of employees and automated services in improving customer experience. The unit includes methods for guiding students through analysis of existing use cases and designing new ones to describe implementation and benefits of these tools.

– **Unit 8: Teaching Enhanced Customer Choice Systems**

This unit prepares teachers to explain how AI algorithms deliver tailored recommendations, enhancing user experience and increasing sales opportunities. Teachers will develop instructional approaches for helping students understand pattern recognition and automated recommendation systems related to customer choices. The unit covers teaching methods for optimizing recommendation engines in a CRM context.

– **Unit 9: Teaching Customer Sentiment Analysis**

This unit develops teachers' competence in instructing students on advanced data collection methods and analysis, specifically for gathering messages from surveys, social media, and application feedback. Teachers will learn approaches for guiding students to extract and analyse valuable insights from feedback to improve products and services. The unit emphasizes pedagogical strategies for helping students understand the importance of customer emotions in CRM.

Competencies:

General competencies

- Advanced Analytical Skills - Ability to analyse and teach data analysis and insight derivation

- Ethical Leadership - Guiding students through ethical implications of AI and data usage
- Pedagogical Problem-Solving - Developing effective teaching solutions for complex CRM/AI concepts

Specific competencies

- Technical Teaching Proficiency - Skills in demonstrating and teaching AI tools for data analysis
- Instructional Design - Ability to create learning activities that develop CRM strategies utilizing AI insights
- Modelling Customer-Centric Approaches - Demonstrating how to foster customer relationships through personalized service

Soft competencies

- Advanced Communication and Instructional Skills
- Analytical Teaching Methods
- Problem-Based Learning Facilitation
- Adaptability in Technology Education

Intended learning outcomes:

After completing this teacher training course, educators will be able to:

- Explain and effectively teach core concepts and principles of CRM in the hospitality industry;
- Demonstrate and explain how AI technologies enhance customer relationship management;
- Apply and instruct on data privacy regulations and security requirements in AI-driven CRM systems;
- Guide students in analysing customer data by utilizing AI-powered tools and techniques;
- Design learning activities for implementing customer segmentation strategies using AI algorithms;
- Create instructional methods for teaching personalization strategies based on AI-generated insights;
- Teach methods for evaluating the effectiveness of AI-driven CRM solutions;
- Demonstrate configuration and management of AI chatbots and virtual assistants;
- Design project-based activities for implementing AI-powered recommendation systems;
- Create assessments for automated sentiment analysis and result interpretation;
- Develop instructional materials on data privacy and security measures in CRM systems;
- Facilitate development of data-driven decision-making skills based on AI-generated customer insights;
- Support students in developing customer service strategies incorporating AI tools;
- Guide students in evaluating and selecting appropriate AI solutions for specific business needs.

Learning and teaching methods:

- Train-the-Trainer Workshops
- Hands-on Technology Labs with CRM software and AI tools
- Instructional Design Sessions for Project-Based Learning

Readings:

Mandatory readings

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Optional readings:

- Pongsakorn Limna (2022). Artificial Intelligence (AI) in the Hospitality Industry: A Review Article. DOI: 10.25147/ijcsr.2017.001.1.103
- Bulchand-Gidumal, J., William Secin, E., O’Connor, P., & Buhalis, D. (2023). Artificial intelligence’s impact on hospitality and tourism marketing: exploring key themes and addressing challenges. *Current Issues in Tourism*, 27(14), 2345–2362. <https://doi.org/10.1080/13683500.2023.2229480>
- Additional pedagogical resources on teaching technology concepts in vocational education

Evaluation

Weight (in %)

Assessment:

25	Development of teaching materials for practical assignments
25	Creation of case studies with teaching notes
25	Design of group projects with assessment rubrics
25	Development of examination tools and evaluation criteria

4.2 Teaching AI for Understanding Tourism Impact and Improving Sustainability

COURSE SYLLABUS	
Course title:	Teaching AI for Understanding Tourism Impact and Improving Sustainability

Study program and level	Study field	Academic school year	Semester
Teacher training	/	2.,3.	4.,6.

Course type

University / school course code:

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECT S
4 h	4 h	4 h			12 h	1

Lecturer:

Language of Lectures:	of	the	English/ national language
Language of Tutorial:	of	the	English/ national language

Prerequisites:

Basic knowledge of tourism principles and basic digital literacy. No prior AI knowledge is required.

Content (Syllabus outline):

This teacher training course prepares educators to teach the application of Artificial Intelligence (AI) in the tourism and hospitality industry, with a strong focus on sustainable development. It covers pedagogical approaches for teaching various AI technologies and how they operate within the socio-economic, environmental, and cultural aspects of tourism. By the end of the course, teachers will be able to effectively guide students in understanding how AI can be integrated into daily processes of public and private organizations operating in the tourism and hospitality industry.

The following modules are particularly emphasised:

Module A: Teaching Fundamentals of AI in Tourism

This module will equip educators with methods and resources to effectively introduce students to AI applications in tourism development. Teachers will learn how to present emerging tourism trends with an emphasis on teaching AI's role in estimating tourism's impacts. The module provides pedagogical strategies for explaining how AI can improve cost efficiency and sustainability within the tourism industry. By the end of this unit, teachers will have developed lesson plans and teaching materials on how AI promotes responsible tourism and supports sustainable goals.

→ Unit A1: Teaching Methodologies for Tourism Trends

This unit focuses on pedagogical approaches for teaching AI concepts in tourism. Teachers will learn how to explain AI definitions, classifications, and applications in a way that engages students. The unit provides instructional strategies for helping students understand technological, socio-demographic, and sustainable development factors affecting tourism. Teachers will develop competencies in creating learning activities that demonstrate how AI tools track trends and provide feedback to organizations. Educators will also learn how to facilitate discussions on ethical issues in AI development including data privacy, bias, and accountability, emphasizing their contribution to trust and sustainability. Teaching materials and assessment strategies will be provided to measure student understanding of AI's role in supporting socially appropriate and sustainable tourism practices.

→ Unit A2: Instructional Approaches for Teaching Impact Assessment

Teachers will develop strategies for instructing students on the basics of AI in evaluating economic, social, and environmental tourism effects. This unit focuses on designing learning activities that demonstrate AI techniques in data gathering and evaluation for making reasonable employee relations decisions. Teachers will create lesson plans incorporating real-world examples at an appropriate difficulty level, learning how to scaffold complex concepts for student understanding. The unit includes guidance on designing formative assessments to gauge student comprehension of AI-based impact assessment methods.

→ Unit A3: Teaching Cost Optimization through AI in Tourism

Educators will learn approaches for teaching the basic aspects of AI-enabled cost optimization in tourism operations with sustainability goals. This unit provides instructional materials and demonstration techniques for explaining AI applications in cost distribution, price determination, and energy management. Teachers will develop classroom activities that clearly illustrate how AI contributes to sustainable and profitable organization management without overwhelming students with complex resource utilization concepts. The unit includes assessment strategies to evaluate student understanding of AI-supported cost optimization principles.

Module B: Pedagogical Approaches for AI in Business Decision-Making

This module prepares teachers to effectively communicate how AI improves decision-making processes in tourism and hospitality. Educators will learn methodologies for teaching students how AI solutions help tourism providers optimize resources, forecast demand, adapt to customers, and improve operational efficiency. The module equips teachers with strategies to guide students in applying AI concepts to real-world business challenges and helps them develop instructional approaches for explaining how technology and quality data support business processes and strategic decisions.

→ Unit B1: Teaching Data Analysis Approaches

Teachers will learn effective methods for introducing students to fundamental AI tools, frameworks, and data analysis approaches. This unit provides educators with instructional strategies and materials for teaching descriptive, diagnostic, predictive, and prescriptive methods. Teachers will develop competencies in designing learning activities that demonstrate how these approaches improve customer engagement and optimize tourism services through pattern discovery, cause understanding, and trend prediction. The unit includes assessment techniques to evaluate student comprehension of data analysis concepts and their role in decision-making.

→ Unit B2: Instructional Strategies for Data-Driven AI Solutions

This unit focuses on preparing teachers to guide students through the practical application of AI-driven data solutions for business challenges. Educators will develop competencies in creating learning activities that demonstrate operational efficiency improvement and demand forecasting techniques. Teachers will learn how to design instructional materials explaining business process improvements: seasonality management, resource optimization, trend recognition, marketing enhancement, and personalization. The unit provides guidance on incorporating real-world AI solution examples into lesson plans and designing appropriate assessments to measure student understanding.

→ Unit B3: Teaching Methods for AI-Based Personalization

Educators will develop instructional approaches for teaching about personalization trends and tools supporting customized travel services. This unit provides teachers with strategies for explaining how personalized recommendations improve customer satisfaction and loyalty. Teachers will learn techniques for demonstrating immersive technologies that create unique customer interactions. The unit includes guidance on facilitating discussions about legal and technical implications of personalization, including privacy, security, and algorithmic bias concerns. Assessment methods for evaluating student comprehension of AI-based personalization concepts are provided.

Module C: Teaching Sustainable Tourism Strategies with AI

In this module, teachers will learn how to guide students in exploring three dimensions of sustainability in tourism—social, environmental, and financial—and AI's role in each. Educators will develop competencies in teaching how AI measures, optimizes, and monitors tourism impacts on culture, community, and environment. The module equips teachers with instructional strategies for explaining AI applications in resource management. Teachers will create lesson plans and learning activities focused on making the tourism industry more sustainable through Artificial Intelligence.

→ Unit C1: Teaching AI Applications for Community and Cultural Impact

This unit prepares educators to analyse specific case studies showing AI's positive impact on culture and local communities. Teachers will develop instructional strategies for presenting these examples—from analysing public engagement to digitizing historic artifacts, from calculating social value of tourism funding to predicting maintenance timing, from crowd management to cross-cultural communication assistance. The unit provides guidance on creating learning activities that demonstrate AI's practical applications for community and cultural impact assessment. Assessment techniques for measuring student understanding of these applications are included.

→ Unit C2: Instructional Approaches for AI-Enhanced Environmental Sustainability

Teachers will learn effective methods for addressing overtourism's environmental challenges in their instruction. This unit equips educators with strategies for teaching AI applications that address pollution, water scarcity, energy consumption, and nature deterioration. Teachers will develop competencies in creating learning activities demonstrating how AI calculates carrying capacity, predicts long-term environmental impacts, and monitors ecological sites. The unit includes instructional materials explaining how these applications inform policymaking and regulations to reduce environmental footprints while maintaining healthy tourist flows. Assessment techniques for evaluating student comprehension of AI's role in environmental sustainability are provided.

→ Unit C3: Teaching Resource Management Strategies through AI

Educators will develop instructional approaches for explaining AI tools that improve energy, water, and waste management in tourism. This unit provides teachers with case studies implemented by public authorities and SMEs for classroom use. Teachers will learn techniques for demonstrating smart energy systems, water conservation applications, and waste reduction approaches. The unit includes guidance on creating learning activities that effectively illustrate these applications' real-world implementation. Assessment strategies to measure student understanding of AI-driven resource management for sustainable tourism are provided.

Competencies for teachers:

General teaching competencies

- Advanced Analytical Teaching: Ability to guide students in analysing tourism data and identifying essential patterns and trends.
- Strategic Course Planning: Capability to structure curriculum around existing trends in tourism technologies, socio-demographic changes, and sustainable tourism development requirements.
- Cost Optimization Instruction: Skill in teaching students about costs within tourism operations and how AI supports sustainable cost management.

- Ethical AI Education: Expertise in teaching responsible AI application in tourism, including data handling, protection, explainable AI and multicultural assessment fairness.
- AI Technology Pedagogy: Proficiency in explaining AI technologies and their applications in tourism and hospitality to students of varying technical backgrounds.
- Data Literacy Instruction: Ability to teach students how to understand and interpret various data sets.
- Sustainability Education: Capability to explain how AI and data analytics support sustainable and personalized tourism experiences.
- Human-centred AI Teaching: Skill in conveying concepts of human agency in AI, including principles of data ownership, privacy, human rights protection, AI explainability, and human control in decision-making.

Specific teaching competencies

- Trend Analysis Instruction: Expertise in teaching methods for analysing technological, socio-demographic, and sustainability trends through data analysis.
- Impact Assessment Teaching: Proficiency in explaining AI techniques for measuring tourism's economic, societal, and environmental effects.
- Cost Optimization Strategy Education: Capability to teach AI applications in resource management, pricing optimization, and environmental impact management.
- Ethical AI Application Teaching: Skill in instructing students on responsible AI tool utilization for unbiased tourism practice assessments.
- AI-based Decision-Making Instruction: Ability to teach students how to use AI for informed business decisions.
- Data Insights Education: Expertise in explaining data analysis basics and their importance to students.
- Personalized Experience Teaching: Proficiency in demonstrating AI applications for tailoring tourism products and services to individual needs.
- Efficient Operations Instruction: Capability to teach AI-driven optimization of staffing, inventory, and resources.
- AI Marketing Education: Skill in explaining AI applications for personalized marketing strategies and customer engagement improvement.
- Sustainability Impact Teaching: Expertise in demonstrating how AI measures, optimizes, and monitors tourism's cultural, community, and environmental impacts.

Pedagogical competencies

- Adaptive Teaching: Ability to modify teaching approaches based on student needs and learning styles when explaining AI applications in tourism.
- Continuous Professional Development: Commitment to staying current with AI technologies and sustainability trends in tourism for curriculum enhancement.

- Problem-Based Instruction: Skill in designing learning activities that challenge students to develop innovative AI-driven solutions for tourism industry problems.
- Critical Thinking Facilitation: Capability to design activities that strengthen students' ability to analyse data and evaluate AI technologies' impact.
- Ethical Awareness Building: Expertise in creating discussions and exercises exploring AI's ethical implications in data privacy, sustainability, and social responsibility.
- Student-Centred Learning: Proficiency in designing customer-focused learning experiences that demonstrate personalized tourism solutions.

Intended learning outcomes for teachers:

- Design and implement effective lessons on analysing technological, socio-demographic, and sustainability trends in tourism using AI tools.
- Develop instructional strategies for teaching AI-based impact assessment techniques that analyse economic, social, and environmental factors of tourism.
- Create interactive learning activities demonstrating how AI optimizes costs while promoting environmental and social sustainability.
- Design curriculum materials examining AI implementation challenges including data privacy, fairness, and sustainability in tourism.
- Construct effective demonstrations of AI tools addressing operational challenges like seasonality, resource allocation, and demand prediction in tourism.
- Develop teaching approaches that effectively illustrate how AI uncovers trends and patterns from complex tourism data sets.
- Create assessment methods for evaluating students' understanding of AI-driven innovations' effects on business performance and customer satisfaction.
- Design interactive learning activities showing how AI measures, optimizes, and monitors tourism impacts.
- Develop instructional materials identifying and assessing AI-driven sustainable tourism development strategies.
- Create case study presentations demonstrating AI's positive impact on culture and local communities.
- Design interactive teaching modules analysing AI's impact on reducing environmental tourism footprints.
- Develop practical demonstrations of AI applications improving energy, water, and waste management in tourism.

Learning and teaching methods for teacher training:

- Interactive Workshops and Demonstrations
- Teaching Materials Creation Workshops
- Case Study Analysis and Teaching Strategy Development
- Technology Integration Workshops for Tourism Education
- Assessment Design and Evaluation Techniques

Readings:

Mandatory readings

Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). "Smart tourism: Foundations and developments." *Electronic Markets*, 25, 179–188. <https://doi.org/10.1007/s12525-015-0196-8>

Durmaz, Y., & Başer, M. Y. (2023). "A systematic literature review on artificial intelligence applications in tourism marketing." *International Journal of Research in Business Studies and Management*, 10, 1–12. <https://doi.org/10.22259/2394-5931.1001004>

Shlash, A., Khanfar, I., al Oraini, B., Vasudevan, A., Suleiman, I., & Zhou, F. (2024). "Predictive analytics on artificial intelligence in supply chain optimization." *Data and Metadata*, 3, 395. <https://doi.org/10.56294/dm2024395>

García, M., & Grilló, A. (2023). "Artificial intelligence in the tourism industry: An overview of reviews." *Administrative Sciences*, 13, Article 172. <https://doi.org/10.3390/admsci13080172>

Buhalis, D., & Leung, D. (2020). "Artificial intelligence in the hospitality industry: Insights from recent studies and research."

Gretzel, U., & Li, X. (2019). *Data Science for Tourism: Theoretical and Practical Dimensions*.

Tussyadiah, I. P. (2019). "AI and the customer journey: How artificial intelligence is transforming the travel experience."

Knaflic, C. N. (2015). *Storytelling with Data: A Data Visualization Guide for Business Professionals*. Wiley.

Correia, R., et al. (2024). *AI Innovations for Travel and Tourism*. ISBN: 9798369321379

Fennell, D. A. (2019). *Sustainable Tourism: Principles, Contexts and Practices*.

Leung, F. W., Law, S., & Lee, D. A. (2021). "Artificial intelligence for tourism: Beyond personalization." *Journal of Hospitality and Tourism Technology*.

Mueller-Eberstein, M., Villafiorita, A., & Batina, L. (2020). *AI for Good: A Practical Guide for Ethics, Innovation and Sustainable Development*.

Evaluation

Weight (in %)

Assessment:

30	Teaching Portfolio Development - Creation of complete teaching materials for one module including lesson plans, student activities, assessments, and resources
40	
30	Demonstration Teaching - Delivery of a sample lesson demonstrating effective teaching of AI concepts in tourism with peer and instructor feedback
	Curriculum Adaptation Project - Development of a customized course syllabus and assessment plan adapted for specific student populations or educational contexts

4.3 Using AI for process automation in teaching and for creating personalised recommendations for learner

COURSE SYLLABUS

Course title: Using AI for process automation in teaching and for creating personalised recommendations for learner

Study program and level	Study field	Academic school year	/ Semester
	/	2.,3.	4.,6.

Course type

University / school course code:

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
16-30		20-40			48-70	3-5

Lecturer:

Language of the Lectures: English/ national language

Language of the Tutorial: English/ national language

Prerequisites:

No prerequisites are needed in order to attend the course

Content (Syllabus outline):

This introductory course is structured to provide teachers and educators with a robust foundation in AI principles to enable fostering of essential skills in personalised learning and self-management in classroom settings. Tailored towards teachers and further education professionals, the course covers AI fundamentals along with its ethical use and personalization. Completion of the course aims to build confidence and appreciation for the ways with which AI tools can promote individual learners' growth and bolster their learning success. Course participants will learn how to set academic and professional goals using AI-driven insights, manage time effectively, and enhance their study strategies through actionable AI feedback. The course also integrates collaborative AI tools to foster teamwork and practical problem-solving, simulating real-world applications to prepare educators and learners for an AI-powered workplace. By engaging with interactive, gamified tools and real-world examples, educators taking the course can better equip learners with critical skills and knowledge to enter their chosen fields with a readiness to adapt and innovate in an increasingly AI-driven environment.

The following modules are especially emphasised:

Module A: Foundations of AI for Personalized Learning and Growth

This module introduces teachers to foundational and applied aspects of AI in education, focusing on its role in personalising learning experiences. The module explores AI fundamentals, customization of learning paths, and ethical considerations, aiming to develop teachers' ability to leverage AI for life-learning success responsibly. Teachers will engage with hands-on activities, case studies, and data-driven insights to apply AI concepts to personalised learning approaches in education.

- **Unit A1 - AI Fundamentals in Personalized Learning**

Teachers will gain comprehensive understanding of AI concepts and personalization in education, including key algorithms and applications tailored for academic growth. Teachers will explore practical methods and examples of how AI can be utilised to foster personalised learning in classrooms, making it ideal for education professionals interested in applied AI methods. Some datasets will be engaged to develop understanding of trend predictions and tailored pedagogy and AI suggestions.

- **Unit A2 - Customising Your Learning Path with AI Insights**

In this unit, educators will explore how AI tools can be utilized to track and review their students' learning patterns, identify gaps in student understanding, aid in setting learning goals for classes, and supplement self-improvement for teachers and students alike. Data literacy is vital for educators to be able to understand and critically assess AI processes and resulting suggestions – allowing them to implement strategic adjustments in their teaching designs. The course will highlight practical ways that generative AI, like large language models, can support customised

learning by identifying gaps and recommending tailored resources and practice materials, promoting self-driven improvement with appropriate corresponding metrics.

- **Unit A3 - Privacy, Ethics, and Responsible Use of AI in Education**

In this unit, teachers will examine ethical considerations, privacy rights, and responsibilities in using AI tools introduced prior. Participants will be engaging in case studies and examining current EU regulations that may affect their pedagogy and their learners by extension. Additionally, the unit seeks to look at machine learning applications in education, with a strong emphasis on the bias and data quality used in training models which provide feedback and suggestions to learners and educators. A deeper understanding of biases in AI models and its generated content will then reiterate the importance of data privacy principles and the extensive work necessary to foster trust in AI applications for educators and learners alike.

Module B: Optimising Study Efficiency and Academic Performance with AI

This module introduces teachers to industry best practices around interpreting and implementing AI-driven feedback. Course participants will develop a deeper understanding on how to refine academic skills and boost learning outcomes in the classroom. The module additionally seeks to introduce industry AI tools and the ways with which these can help scheduling in classroom, meeting academic deadlines, and managing educator workloads. By understanding AI recommendations, educators can tailor teaching strategies to the unique needs and strengths of their learners. Through advanced applications of AI planners, teachers will also develop techniques for balancing multiple academic responsibilities effectively. Additionally, the module equips educators how to use AI tools to enhance collaboration in academic spaces and classrooms particularly.

- **Unit B1 - AI-Enhanced Feedback and Study Strategies**

Through the unit, teachers are expected to understand how AI feedback mechanisms analyse and provide insights on academic tasks. Additionally, successful learners can apply AI-generated feedback to adjust their study habits, improve academic performance, and set targeted learning goals. Lastly, the unit seeks to evaluate the effectiveness of personalised study strategies derived from AI recommendations for continuous self-improvement.

- **Unit B2 - Managing Time and Tasks with AI Assistance**

The unit explores various AI tools that assist with time management, task prioritisation, and deadline tracking. Upon completion, teachers will be able to demonstrate and use AI-driven planners in optimisation of personal and learner schedules in order to maximise productivity. The unit seeks to further teachers' understanding and appreciation of the impact of AI-assisted time management on academic performance and personal well-being of their students. By demonstrating effective use cases, teachers can show learners techniques for prioritization, task batching, and workflow optimization to promote deeper engagement with learning materials and better manage attention and focus in the learning process.

- **Unit B3 - Collaborative Learning and Team Dynamics through AI**

The unit aims to develop educators' understanding of how AI tools can streamline group work in class settings. By introducing AI tools that enable effective task delegation and role assignments based on data reflecting strengths and performance of learners, the students can identify where they can contribute the most effectively and learn by

offering supplemental support in other group tasks. With this knowledge, team leads and teachers alike can promote and effectively use AI solutions to monitor team contributions. This also helps ensure balanced and proportional participation among group members and further enables students to reflect on the impact of AI on their group dynamics. Effective demonstrations from teachers can prepare their students for AI-assisted workspaces and industry after graduation.

Module C - Innovating Learning Techniques with AI

The module covers the application of artificial intelligence to bolster creative thinking and collaborative learning in classrooms. Through the module, teachers are trained to apply and demonstrate effective use of AI in the process of encouraging innovation, creativity and technological adoption to improve educational outcomes.

- **Unit C1 - Enhancing Problem-Solving and Research Skills with AI**

Through this module, teachers will develop research skills aided by AI tools. Educators will be trained to teach data collection strategies using AI, critically engage with the data generated and collated, and then appropriately select and apply various methods of data analysis to aid in problem solving and reasoning. Participants will be introduced to the use of AI to analyze real professional problems with an emphasis on creative solutions.

- **Unit C2 - Interactive Learning through AI-Driven Gamification**

Participants of this module will explore AI-Driven Gamification and gain an appreciation for AI simulations and quizzes to perfect important gamification concepts. Educators will be shown through examples and case studies how to successfully adjust the difficulty of the content to match the performance of the participants and keep them challenged and engaged as much as possible. Educators taking this module will explore ways in which AI tools can help monitor individual learner progress, assess and identify learner difficulties in the classroom, and provide personalized feedback.

- **Unit C3 - AI's Future in Education and Professional Development**

Explore the evolving role of AI in education and its use for innovative solutions; discuss real-world applications and prepare for AI-driven roles in future careers.

Teachers will be trained, through examples, to explore the applications of AI in various industries and education. Module participants will research and analyse the labor market to understand how AI is changing the future of work and understand what the call to action is for educators seeking to prepare the future generation of industry professionals. Through use cases and reading materials, participants will develop a wide understanding of the general skills needed for careers that use AI.

Competencies:

General competencies

- General Competency 1 - understanding of fundamental AI concepts, including machine learning (ML) and data analysis, which serve as the backbone for personalization in educational contexts.
- General Competency 2 - ability to interpret and apply data analysis skills to personalize learning paths, enhance student engagement and enable progress tracking.
- General Competency 3 - foundational understanding of ethical principles related to AI, including privacy, data security, and bias.
- General Competency 4 - Understand and implement AI-driven feedback to improve individual and group academic performance in classrooms.
- General Competency 5 - Use AI-based tools strategically for prioritization, learner journey management, and collaborative learning.
- General Competency 6 - Implement AI resources to facilitate teamwork in group projects, ensuring equitable contributions and improved team dynamics.
- General Competency 7 - Participants will develop the skill of using AI tools to collect, analyze and synthesize data in the profession.
- General Competency 8 - Participants will learn about the concept of gamification and the role of artificial intelligence in creating interactive and motivating educational content.
- General Competency 9 - Participants will learn about the use of AI in their profession and various industries.

Specific competencies

- Specific Competency 1 - Knowledge of key AI algorithms used in personalization.
- Specific Competency 2 – Identification and application of key algorithms, such as recommendation systems and natural language processing, to customise learning experiences.
- Specific Competency 3 – Assessment and application of ethical principles to real-world scenarios, ensuring responsible use of AI tools.
- Specific Competency 4 - Apply and demonstrate personalised AI feedback processes to aid learners in refining learning habits and reinforcing understanding where gaps exist.
- Specific Competency 5 - Manage academic tasks efficiently by leveraging AI tools for planning and prioritisation.
- Specific Competency 6 - Facilitate group projects using AI tools for role assignment and tracking contributions, ensuring productive collaboration.
- Specific Competency 7 - Participants will be able to gather and use data to solve professional problems using AI tools.
- Specific Competency 8 - Participants will be able to design a basic gamified educational task using AI tools.
- Specific Competency 9 - Participants will be able to recognize the application of AI in their profession and use it for professional training.

Soft competencies

- Soft Competency 1 - Ability to evaluate AI solutions critically, question underlying assumptions, and apply AI tools innovatively to address diverse learning needs.
- Soft Competency 2 - Foster a mindset of continuous learning and adaptability, staying updated with the evolving nature of AI and its applications.
- Soft Competency 3 - Make informed decisions using AI in learning based on ethical considerations.
- Soft Competency 4 - Enhance adaptability and critical thinking in integrating AI tools into various academic tasks.
- Soft Competency 5 - Foster teamwork and communication skills through AI-enhanced collaborative practices.
- Soft Competency 6 - Cultivate self-improvement through reflective analysis of AI-generated feedback and recommendations.
- Soft Competency 7 - Develop creative thinking and adaptability when applying AI technology to real problems.
- Soft Competency 8 - Develop cooperation and motivation skills through the adaptation of educational content by increasing the motivation of students or colleagues.
- Soft Competency 9 - Develop the ability to adapt and be open to changes in careers and technological advances.

Intended learning outcomes:

- Learning Outcome 1 - Learners will demonstrate the ability to use AI-driven analyses and apply educational data responsibly to inform individualized learning paths, content engagement, and learning progress tracking
- Learning Outcome 2 - Apply AI-based tools for adaptive learning, performance tracking, and self-guided improvement.
- Learning Outcome 3 - Implement AI-powered educational solutions while ensuring compliance with data protection laws and ethical AI principles.
- Learning Outcome 4 - Learners can analyze and apply AI-generated feedback to develop study strategies that address personal academic challenges.
- Learning Outcome 5 - Utilize AI tools for effective time management, demonstrating a balanced approach to academic deadlines and personal productivity.
- Learning Outcome 6 - Reflect on and evaluate the impact of AI-enhanced feedback and collaboration strategies on personal academic performance.
- Learning Outcome 7 - Participants will be able to use artificial intelligence in education and in their profession.

- Learning Outcome 8 - Implement AI-driven automation and personalized learning strategies in professional education settings.

Learning and teaching methods:

- Learning & Teaching methods 1: **Lectures and demonstrations** will provide core theoretical content, presenting essential AI concepts, personalization principles, gamification concepts, and the ethical landscape in AI. **Interactive polls and quizzes** can assess students' understanding of key points in real-time.
- Learning & Teaching methods 2: **Hands-on labs** will allow learners to work with AI tools and algorithms for personalised learning. **Generative AI exercises** could involve tools like ChatGPT or similar language models where learners practise setting up prompts, analysing AI-driven recommendations, and customising learning suggestions.
- Learning & Teaching methods 3: **Case studies** may cover specific AI-powered learning platforms or ethical dilemmas, such as privacy issues in learners data.
- Learning & Teaching methods 4: Case discussions for analysis of real-world examples to connect theoretical concepts with practical use cases for AI in education. **Group discussions** can follow each case study, allowing students to debate AI's benefits and risks and collaboratively solve ethical challenges, particularly in data privacy and responsible AI usage. Other topics may include the role of AI in the jobs of the future, how to balance automation and human creativity, copyright, etc
- Learning & Teaching methods 5: Hands-on activities that feature interactive tutorials focused on setting up and using AI tools for academic feedback, time management, and collaboration
- Learning & Teaching methods 6: Group tasks where students practice using AI tools in a collaborative environment to simulate effective team project management.

Readings:

Mandatory readings

- Seldin, S. (2022). *AI in Education: A Practical Introduction for Teachers and Students*. Boston: Pearson Education.
- Hwang, G.-J., & Chen, N.-S. (2023). *Exploring the Potential of Generative AI in Education: Applications, Challenges, and Future Research Directions*. *Educational Technology & Society*.
- Aiken, S. C. (2020). *Machine Learning, Ethics, and Society*. Cham, Switzerland: Springer.,
- Marengo, A. & Pange, P. (2024) "Envisioning General AI in Higher Education: Transforming Learning Paradigms and Pedagogies", *Creative Approaches to Technology-Enhanced Learning for the Workplace and Higher Education*, Conference Paper, pp. 330–344.
- Mononen, A., Alamäki, A., Kauttonen, J., Klemetti, A., & Räsänen, E. (2021) "Adopting AI-enhanced chat for personalising student services in higher education", *eSignals Research*, special issue of AINL Artificial Intelligence and Natural Language Conference, pp. 1-12.

- Williams, R. & Ingleby, E. (2024) "Artificial Intelligence (AI) in practitioner education in higher education (HE)", *PRACTICE: Contemporary Issues in Practitioner Education*, DOI: 10.1080/25783858.2024.2380282.
- Yu, H., Miao, C., Leung, C. & White, T. (2017) "Towards AI-powered personalization in MOOC learning", *Nature Partner Journals, Science of Learning*, pp. 2-15. DOI: 10.1038/s41539-017-0016-3.

Evaluation

Weight (in %)

Assessment:

xx	<p>Assessment type 1</p>
yy	<p>A culminating mini project allows students to demonstrate their grasp of AI in personalized learning by proposing an AI-driven educational solution or framework. They could explore ethical aspects, data privacy, and/or AI application limitations.</p>
zz	<p>Assessment type 2</p> <p>Presentations of their projects will help them synthesize learning and communicate complex ideas, preparing them for real-world professional environments.</p> <p>Assessment type 3</p> <ul style="list-style-type: none"> • Analysis of tasks created by students using AI tools • Short quiz • Analysis of completed projects • Discussion

4.4 Training Teachers to Human-AI Collaboration in Teaching and Learning

COURSE SYLLABUS	
Course title:	Training Teachers to Human-AI Collaboration in Teaching and Learning

Study program and level	Study field	Academic school year	Semester
Teacher Training	/	2.,3.	4.,6.

Course type	Teacher Professional Development
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University / school course code:	
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Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECT S
						1

Lecturer:	TBD
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Language of the Lectures:	of	the	English/ national language
Language of the Tutorial:	of	the	English/ national language



Prerequisites:

Basic digital literacy and understanding of pedagogical concepts. Teaching experience or background in education.

Content (Syllabus outline):

This teacher training course prepares educators to effectively teach the “Human-AI Collaboration in Teaching and Learning”-curriculum in both IVET and CVET contexts. The course focuses on pedagogical approaches, assessment strategies and technical knowledge needed to deliver engaging and effective instruction on AI integration in educational settings.

The course consists of the following modules:

Module 1: Understanding AI Education Fundamentals

This module will provide teachers with the fundamental knowledge of AI in education. It will provide a conceptual framework for explaining artificial intelligence in accessible language. Emphasis is placed on practical applications rather than technical jargon. It also focuses on assessment techniques utilizing AI and helps teachers to adapt their curriculum according to various student needs.

- Unit 1.1: Pedagogical approaches for teaching AI concepts

The unit addresses the challenge of teaching AI concepts to students with varying levels of technical background, and provides teachers with techniques for bridging knowledge gaps. Teachers will examine case studies of successful AI education in different settings and analyze which approaches work best in different learning contexts. Teachers will learn to identify and address common misconceptions about AI in education, while promoting a balanced view of AI's capabilities and limitations.

- Unit 1.2: Curriculum Adaptation Techniques

This unit analyzes the difference between IVET- and CVET-courses, identifying core concepts that must remain consistent across both contexts while recognizing opportunities for adaptation. The unit provides systematic frameworks for condensing or expanding content based on learner needs, time constraints, and prior knowledge.

- Unit 1.3: Assessment Design for AI Education

This unit builds the capacity of educators to create meaningful assessments that effectively measure both theoretical understanding and practical application of AI in educational contexts. The unit covers the development of rubrics for assessing AI implementation projects, and the design of automated assessment tools to assist educators with grading and feedback.

Module 2: Teaching Skills for AI-Enhanced Learning

This module develops educators' abilities to confidently demonstrate and teach with AI-powered educational tools in classroom settings while also addressing the need for educators to adapt their teaching approaches based on specific educational sectors and institutional contexts. Additionally, it prepares educators to guide meaningful, balanced discussions about the ethical dimensions of AI in education.

- Unit 2.1: Technical Demonstration Competencies

Participants will receive hands-on training with key AI technologies referenced in the Human-AI Collaboration curriculum, including adaptive learning platforms, intelligent tutoring systems, automated feedback tools, and educational chatbots. Teachers will practice preparing and delivering technical demonstrations that highlight AI functionalities while keeping focus on educational applications rather than technical specifications.

- **Unit 2.2: Facilitating Critical Discussions on AI Ethics**

Attention will be given to developing educators' skills in explaining algorithmic processes in accessible terms, creating understandable mental models of how AI systems process information and make recommendations in educational contexts. Building on this, participants will develop frameworks for addressing sensitive topics such as algorithmic bias, privacy, autonomy concerns, and equity issues in AI educational systems.

- **Unit 2.3: Adapting Instruction for Different Education Sectors**

Participants will analyze how AI integration in education manifests differently across vocational training centers, secondary schools, higher education institutions, and workplace learning environments. Teachers will develop contextual analysis tools for assessing the specific needs and constraints of different educational environments, learning to adapt their instructional approaches accordingly.

Competencies:

General competencies

- Ability to effectively teach AI concepts to diverse learner groups
- Skill in adapting technical content for different educational contexts
- Capacity to discuss ethical AI use in educational settings
- Knowledge of assessment strategies appropriate for AI education

Specific competencies

- Proficiency in demonstrating AI-powered educational tools to learners
- Ability to guide students in creating adaptive learning experiences

Soft competencies

- Adaptability in teaching approaches for different learner needs
- Communication skills for explaining complex technical concepts clearly
- Openness to continuous learning about emerging AI technologies
- Reflective practice in AI-enhanced teaching methodologies

Intended learning outcomes:

Teachers will be able to:

- Adapt their teaching approach to meet the different needs of IVET and VET learners

- Demonstrate AI educational tool with confidence and technical accuracy
- Design effective assessments that measure AIU competencies in education
- Facilitate critical discussions about ethical implications of AI in learning
- Guide students through hands-on experiences with AI educational technologies

Learning and teaching methods:

- Demonstration teaching (modeling effective AI education techniques)
- Technical workshops on educational AI tools
- Case study analysis of successful AI implementation in education
- Collaborative lesson planning

Readings:

- Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education*, 57(4), 542-570. <https://doi.org/10.1111/ejed.12533>
- Pedagogical Approaches for Technology-Enhanced Learning in Teacher Education https://doi.org/10.1007/978-3-030-77040-2_8

Evaluation

Weight (in %) **Assessment:**

40%	Teaching demonstration - Delivery of a sample lesson
30%	Lesson plan portfolio - adapted plans for both IVET and CVET contexts
20%	Reflective journal - Analysis of teaching approaches for different learner groups
10%	Peer teaching feedback - Constructive assessment of colleagues' teaching demonstrations

4.5 Synthetic Patient Records: how and why?

COURSE SYLLABUS						
Course title:		Synthetic Patient Records: how and why?				
Study program and level	Study field			Academic school year	Semester	
Teacher Training	HEALTH SECTOR			2.,3.	4.,6.	
Course type				MOOC		
University/school course code:						
Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECT S
x (Online)			x	x	x	3
Lecturer:						
	Language of the Lectures:	English/ national language				
	Language of the Tutorial:	English/ national language				

Prerequisites:

A basic understanding of the applications of AI.
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Content (Syllabus outline):

This course is for educators expecting to integrate Artificial Intelligence (AI) into their teaching of healthcare education. It examines the impact of AI on the health sector and how synthetic (fake data) data is becoming a best practice for working with AI in many situations. This course will examine motivation, technologies, legal and ethical requirements, and how these requirements are affecting practices. The course is based on practical examples emphasising educators adapting and updating the content and AI simulation methods to their curriculums later.

By the end of the course, educators may have a comprehensive understanding of how AI shapes the future of healthcare and the responsibilities of implementing these innovative and ground-breaking technologies. The teacher will also have the means to stay updated with a rapidly changing AI landscape and provide the educator's students with relevant contextual content.

The following topics provide the necessary details:

1. Module: Case Studies

After a brief introduction to AI's general context, the educator will review specific case studies within the healthcare industry. During their course work the educators will adapt a selection from the case studies to their own teaching environment.

- 1.1 1.1. UNIT: Introduction to AI

In this short unit, educators are introduced to the core themes associated with AI. The introduction is divided into three themes: What is AI? defines the key characteristics of AI. Common applications of AI detail general usage. Ethical considerations explain how crucial ethics are for developing trust in AI adoption.

- 1.2 1.2. UNIT: Introduction to the usage of AI in the health sector

In this unit, educators will delve deeper into the transformative role of AI in healthcare and explore current applications and future trends. Educators will also review how AI algorithms enhance diagnostic accuracy and how AI integration into the "patient journey" aids personalized care and monitoring. By studying these examples, educators may gain a comprehensive understanding of the benefits and challenges related to the adoption of new technologies in healthcare settings.

- 1.3 1.3. UNIT: Real-world case study

During this unit, educators conduct an in-depth analysis of a specific real-world case in which AI is implemented in the health sector. Specifically, exploring the steps taken to design and implement an AI-empowered solution, the challenges encountered, and the strategies to overcome them. The outcomes of the case study, key performance indicators, and clinical benefits will be critically evaluated. Through this hands-on, real-world case study, educators may gain practical insights into the complexities of managing and deploying AI solutions in real-world healthcare environments, understanding both the beneficial impacts and the obstacles.

1.4 1.4 UNIT: Balancing innovation with patient safety: ethical considerations and regulatory challenges

The unit will discuss the ethical principles guiding the development and deployment of AI technologies, such as patient consent, privacy, and data security. Legal considerations will be examined, focusing on compliance with data protection regulations and their impact on product development. Educators will identify strategies that effectively manage risks by analyzing best practices from successful AI implementations. The importance of cross-functional and multidisciplinary collaboration among experts in different fields will be emphasized to ensure that innovations are effective, scientifically and clinically beneficial, and ethically sound.

2. MODULE: Diving into Synthetic Data

This module focuses on specific aspects explored in the case study module. Including the wide-ranging application of synthetic data within the health sector, including its properties, techniques, and application. During the course work educators will develop skills to apply synthetic data within their own teaching context.

1.5 2.1. UNIT: The properties of Synthetic data

Within this unit, educators explore the problems synthetic data may address within the health sector and the basic properties of artificial data. Specifically, the unit focuses on rule-based and distribution-based data. The unit will also explore how security is enhanced, and legal requirements may be relaxed. Finally, the unit discusses the uses of synthetic data in training and specific real-world scenarios

1.6 2.2. UNIT: Techniques and tools to generate synthetic data

Many tools and synthetic datasets are available for free. This unit teaches educators what is available and how the data and tools may be used. Emphasis is placed on using available data and tools, visualization, and deployment scenarios.

1.7 2.3. UNIT: Use of synthetic data for research and development for privacy preservation.

This unit focuses on leveraging synthetic data to innovate and implement proof of concepts while preserving patient privacy. It will discuss the advantages of using synthetic data, including compliance with privacy laws and the ability to share data more freely among research groups. Additionally, the limitations and challenges associated with synthetic data, such as ensuring data validity and utility, will be critically analyzed to provide a balanced understanding of these data in innovation and research in the healthcare sector.

3. MODULE: EU regulatory frameworks for AI-enhanced medical devices

This module explores the relationship between the regulation frameworks, medical devices and trust in AI. During the course work educators will learn how to keep track of a changing legal landscape. the educator will explore the necessary authoritative resources needed to keep track of

1.8 3.1. UNIT: Overview of the EU AI Act

The AI ACT is a European-wide Legal framework that will dominate the requirements for deploying AI within the Health Sector. This unit explores the framework, associated business processes, and legal frameworks. It also lays out the relationship with synthetic data and details several successes and failures within the sector.

1.9 3.2. UNIT: The relevance of MDR and IVDR for AI-enhanced medical devices.

This unit reviews the Medical Device Regulation (MDR) and In-Vitro Diagnostic Regulation (IVDR) within the European Union and their implications for AI-enhanced medical devices. Students will discuss how these regulations define medical devices and diagnostics and the specific safety, performance, and quality standards they impose. The entire process of obtaining CE-marking will be examined, highlighting the challenges in demonstrating compliance for AI-based devices. Understanding this legal framework is crucial for anyone involved in designing, developing, deploying, or using AI innovations in healthcare, as it ensures that new technologies meet the necessary standards to protect patient health and safety.

1.10

1.11 3.3: UNIT: Content adaptation

The critical themes described in previous topics are used by the educator to integrate content relevant for their own teaching environment. A personal project will be assigned that involves the educator providing an update on a specific theme associated with the state of AI in the health sector. The project integrates previously generated content, lesson plans, case studies, and structures the timeline of the content based on pedagogical adaptation into a consistent structure ready to deploy to a MOOC environment.

Competencies:

General competencies

- **Ethical awareness:** Details the central themes around working with new technologies.
- **Desktop research:** Conducts research on a specific theme by searching the Internet
- **AI fundamentals:** Able to define use cases for AI, describe specific tools, explain what makes for trustworthy AI, and detail AI-specific terminology such as Deep Learning, Machine Learning, Generative AI, and AI system.

Specific competencies

- **Generation of learning material** within the context of teaching AI in healthcare
- **Adaption of AI tooling** within the context of teaching AI in healthcare
- **Development of lesson plans** within the context of teaching AI in healthcare

- **Ethics of AI in health:** Analyze and group ethical issues related to AI usage and the application of synthetic data in healthcare
- **Data Management of synthetic health data:** Define the key processes of data management, including Data transformation, converting data into a suitable format or structure for the patient or other health records, data imputation for health-related data, the process of replacing missing or incomplete data with substituted values, and identifying and handling outliers, noise, and anomalies.
- **Generation of Synthetic Health Data:** Apply open-source tools to generate realistic-looking health-related data, explaining how synthetic data generation processes protect patient privacy.
- **Prompt Engineering for the health sector:** Writing accurate text commands for AI to generate data that optimises synthetic data generators. Able to explain different prompting strategies such as zero, few-shot and Chain of thought. Able to run models locally.
- **Sector-based Ethical requirements:** Define ethical considerations of using AI specific to the health sector
- **Legal:** Understand the scope, objectives, and key provisions of the AI Act, including its implications for the health sector.
- **Tooling:** Apply several open-source tools to manage, generate and visualise AI-related health data.

Soft competencies

- Problem-Solving
- Communication
- Collaboration
- Continuous Learning
- Critical thinking

Intended learning outcomes:

- L1. Demonstrate a general understanding of AI's role in enhancing healthcare practices.
- L2. Explain to students the principal concepts associated with synthetic data, its importance, and its applications in the health sector, including how it differs from real-world data.
- L3. Provide examples of AI tooling within the health sector
- L4. Develop case studies based on ethical issues related to AI, including bias, privacy concerns, and the responsible use of synthetic data in healthcare settings.
- L5. Utilize synthetic data within the context of teaching within the healthcare sector. Including generating structured patient records using AI-generated synthetic data. Visualising patient populations within the synthetic data using open-source tools and evaluating the quality of the synthetic data using visual methods.

- L6. Communicate the core concepts to students of the digital health legislation framework and how EU regulation affects AI in healthcare. Including the EU AI Act and its implications for AI-driven healthcare innovations and compliance
- L7. Update lesson plans based on systematic desktop reviews of the status of AI within the Health Sector
- L8. Document strategies for Pedagogical Adaptation of AI Case studies into course content.
- L9. Document strategies for student mentorship while using AI tooling.

Learning and teaching methods:

- Online Lecture-Based
- Problem-Based Exercises
- Case Study
- Simulated Environment / Technology enhanced
- Collaborative Exercises
- Formative & Summative assessment
- Peer Feedback
- Assignments

Readings:

Mandatory readings:

- Feigerlova, E., Hani, H. & Hothersall-Davies, E. A systematic review of the impact of artificial intelligence on educational outcomes in health professions education. *BMC Med Educ* 25, 129 (2025). <https://doi.org/10.1186/s12909-025-06719-5>
- [Ethical Issues of Artificial Intelligence in Medicine and Healthcare](#)
- [Harnessing the power of synthetic data in healthcare: innovation, application, and privacy](#)
- [New Medical Device Regulation in Europe: A Collaborative Effort of Stakeholders to Improve Patient Safety](#)
- [The gaps between the new EU legislation on in vitro diagnostics and the on-the-ground reality](#)

Optional readings:

- [Synthetic data generation methods in healthcare: A review on open-source tools and methods](#)
- [Regulation \(EU\) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices](#)

- [Regulation \(EU\) 2017/746 of the European Parliament and of the Council of 5 April 2017 on in vitro diagnostic medical devices](#)

Evaluation

Formative test:
Multiple choice

Summative tests: Written, Group, Exam

Weight (in %)

Assessment:

Context		
- 0	%	- Multiple Choice KEY learning outcomes, prerequisites
- 10	%	- Create a lesson plan: Writes a lesson plan for their own AI related case study L7, L1
- 10 %		- Presentation: Educators present their own case study and are peer reviewed. L4, L1
- 10 %		- Demonstration: Provides a screencast of the educator running and explaining an AI tool L3
Synthetic Data		
- 10 %		- Demonstration: Provides a screencast of the educator Visualizing and explaining health statistics based on a synthetic data set. L5
- 10 %		- Presentation: Market research on synthetic usage within the health sector L2

<p>- 10 %</p> <p>Ethics and Regulatory Constraints</p> <p>- 10 %</p> <p>- 30 %</p>	<p>Group assignment: Create and review each other's Lesson plan teaching students the principal concepts associated with synthetic data, its importance, and its applications in the health sector, including how it differs from real-world data. L2, L1</p> <p>- Presentation: Eu Regulations. Explaining the core concepts to students of the digital health legislation framework and how EU regulation affects AI in healthcare. Including the EU AI Act and its implications for AI-driven healthcare innovations and compliance L6</p> <p>- Project: Integration of previously generated content into a course structure based on various pedagogical practices. L9, L8</p>
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4.6 Enhancing Doctor-Patient Interactions with AI

COURSE SYLLABUS

Course title: Enhancing Doctor-Patient Interactions with AI

Study program and level	Study field	Academic school year	Semester
CVET	/	2.,3.	4.,6.

Course type IVET - Medical Training in AI

University / school course code:

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECT S
						5

Lecturer:

Language of Lectures:	of	the	English/ national language
Language of Tutorial:	of	the	English/ national language

Prerequisites:

Pre-existing experience in professional instruction in medicine or other related fields. Comprehensive didactic and pedagogical experience.

Content (Syllabus outline):

The course on the basic level deals with Artificial Intelligence, by establishing the socio-cultural, political and economic context of information and communication technologies with complex cause and effect associations. This curriculum has been specifically designed for teachers who will teach in these areas of initial basic competencies. There are three modules which the course focuses around. These are:

1.12 Module 1: Introduction to Challenges in Doctor-Patient Interactions

1.12.1 Unit 1: Broad Issues in Doctor-Patient Interactions

1. Definition and Importance

Effective communication between doctors and patients is a cornerstone of quality healthcare. When communication is unclear or hindered by various barriers, it can lead to reduced patient satisfaction, misdiagnosis, and lower treatment adherence. Studies show that strong communication correlates with better patient outcomes (Stewart et al., 2000). Understanding the broad issues in these interactions is essential for future healthcare professionals and for optimizing patient care.

2. Key Challenges

1. Communication Barriers

- **Medical Jargon:** Technical language can alienate patients who lack medical background.
- **Language Differences:** Non-native speakers may struggle to articulate symptoms or comprehend instructions, leading to misunderstandings.
- **Insufficient Explanation Time:** High patient volumes can pressure clinicians to rush through appointments.

2. Unrealistic Expectations

- Patients may expect immediate cures or underestimate the complexity of certain conditions and treatments.
- Unrealistic expectations often result in disappointment or non-adherence if the expected outcomes are not met.

3. Lack of Empathy

- Emotional disconnect can make patients feel unheard, reducing trust in the medical advice provided.
- Stress or burnout among healthcare professionals can lead to diminished empathetic responses.

4. Time Constraints

- Short consultation times can hamper meaningful dialogue, as clinicians must gather key information quickly.
- Prioritizing tests and diagnostics over conversation can leave patients with unanswered questions.

5. Non-Adherence to Medical Advice

- Patients may forget instructions, misunderstand dosage requirements, or face socioeconomic barriers.
- Non-adherence is associated with higher hospitalization rates and increased healthcare costs (World Health Organization, 2003).

6. Previous Negative Experiences

- Patients carrying emotional baggage from prior poor experiences may be less trusting or more anxious.
- These experiences can lead to doctor-shopping, skepticism, or avoidance of needed care.

3. Example from Practice

Consider a 60-year-old patient with multiple chronic conditions visiting a busy urban clinic. Under time pressure, the physician uses medical jargon to explain the treatment plan. The patient, feeling overwhelmed and misunderstood, leaves the appointment with confusion. Their non-adherence to the medication regimen eventually leads to complications. This example highlights how limited empathy, jargon, and time constraints can intersect and negatively impact patient outcomes.

1.12.2

1.12.3

1.12.4

1.12.5 **Unit 2: Ethical Issues and Regulatory Compliance**

1. Importance of Ethics in Doctor-Patient Interactions

Healthcare professionals must balance patient welfare, autonomy, and societal responsibilities. Ethical practice ensures respect, fairness, and transparency, while regulatory compliance protects patient safety and upholds professional standards. Ethical lapses can erode trust, discourage patient engagement, and potentially lead to legal repercussions.

2. Key Ethical Considerations

1. Informed Decision-Making Through Access to Scientific Data/Statistics

- Patients have the right to clear, unbiased information about their diagnoses and treatment options.
- Practitioners should present data in a patient-friendly manner, ensuring understanding and respect for patient autonomy.

2. Confidentiality

- Protecting patient privacy is crucial, as sensitive information must be disclosed only to relevant parties.
- Adherence to regulations like GDPR (in the European Union) is mandatory and the AI Act.

3. Balance Between Cultural Norms and Life-Saving Practices

- Cultural beliefs may conflict with recommended treatments; ethical practice requires sensitivity and respect for cultural values while prioritizing patient well-being.
- Providers might need to seek cultural mediation or employ trained interpreters to bridge gaps in understanding.

3. Regulatory Frameworks

- **Professional Guidelines:** Medical associations publish codes of conduct that guide ethical practice.
- **Legal Standards:** National and international laws govern patient data, consent, and liability.
- **Institutional Policies:** Hospitals and clinics often have strict protocols on privacy, consent, and communication standards.

4. Example from Practice

A pediatrician encounters parents who refuse certain vaccinations due to cultural beliefs. The doctor navigates ethical obligations to protect the child's health and respect parental autonomy while also adhering to public health regulations. This scenario illustrates the delicate balance between cultural norms, ethical considerations, and regulatory mandates.

1.12.6 Unit 3: Current Scope of AI Tools in Medicine to Support Doctor-Patient Interactions

1. Overview of AI's Role

Artificial Intelligence (AI) is emerging as a powerful ally in addressing communication barriers, streamlining workflows, and enhancing personalized care. From virtual assistants to decision-support systems, AI can reduce the administrative burden on clinicians and improve patient understanding, ultimately contributing to better clinical outcomes.

2. Types of AI Tools in Doctor-Patient Communication

1. Speech Recognition and Natural Language Processing (NLP)

- Transcribe clinical notes in real-time, freeing physicians to maintain direct eye contact with patients.
- Enable chatbots to interpret patient queries and provide preliminary guidance.

2. Clinical Decision Support Systems (CDSS)

- Analyze patient data to suggest diagnoses or treatment options.
- Offer evidence-based recommendations that can be discussed in simpler terms with patients.

3. Patient Engagement Platforms

- Automate appointment reminders, follow-up messages, and educational resources.
- Support telemedicine solutions that expand access, especially for remote or underserved populations.

3. Potential Benefits

- **Enhanced Communication:** Automated translation and simpler language explanations can break down barriers.
- **Time Optimization:** AI can handle routine tasks, giving physicians more time to interact with patients.
- **Data-Driven Insights:** Personalized analytics can help tailor advice to a patient's unique medical and cultural background.

4. Limitations and Ethical Considerations

- **Data Privacy:** AI systems require large datasets, raising concerns about secure handling of personal health information.
- **Equity of Access:** Patients in lower-resource settings may lack the technology or connectivity to benefit from AI tools.
- **Human Oversight:** Over-reliance on AI can undermine the clinician's role, necessitating guidelines to preserve the human touch.

5. Example from Practice

A busy outpatient clinic deploys an AI-driven scheduling and reminder system. Missed appointments drop significantly, and patients report better understanding of preparatory instructions due to automated, multilingual text messages. Clinicians, freed from some administrative tasks, dedicate more time to addressing patient concerns—illustrating how AI can improve both efficiency and patient experience.

1.13.1 Unit 1: Overview of Communication Challenges in Doctor-Patient Interactions

1. Definition and Significance

Communication challenges are among the most common and pressing issues in healthcare. A successful doctor-patient interaction requires clear exchange of information, mutual respect, and empathy. When obstacles arise—such as language differences, cultural nuances, or emotional distress—these interactions can break down, impacting diagnosis and treatment.

2. Common Communication Barriers

1. Language Differences

- Patients who speak a different language than their healthcare provider often rely on family members or untrained interpreters, which can compromise accuracy.
- Specialized medical terminology may not have direct translations, further complicating interactions.

2. Cultural Nuances

- Body language, norms around direct questioning, or taboos around specific health topics can hinder open dialogue.
- Gender roles in certain cultures may dictate who can speak about specific health issues.

3. Emotional and Psychological Factors

- Anxiety, fear, or denial can prevent patients from absorbing critical information.
- Clinicians may inadvertently overlook subtle cues of distress if time is limited.

3. Impact on Patient Outcomes

- **Misdiagnoses:** Incomplete information or misunderstandings can lead to incorrect clinical decisions.
- **Lower Patient Satisfaction:** Patients who feel misunderstood or rushed are less likely to trust their provider.
- **Reduced Adherence:** Without clear instructions, patients may take medication incorrectly or skip follow-ups.

4. Example from Practice

A multilingual emergency department receives a patient who primarily speaks a minority language. With no trained interpreter available, the patient's 10-year-old child attempts to translate. The physician struggles to gather accurate clinical information, leading to confusion about the patient's symptoms and delays in initiating treatment.

1.13.2 Unit 2: Language Barriers and Translating Instructions

1. Scope of the Problem

The World Health Organization recognizes language barriers as a critical global health challenge, particularly in regions with diverse linguistic populations or among migrant communities (WHO, 2017). Accurate translation is vital for patient consent, compliance, and overall satisfaction.

2. Barriers to Effective Translation

- **Lack of Qualified Interpreters:** Hospitals may lack the resources to have staff interpreters available 24/7.
- **Medical Terminology Gaps:** Some medical terms do not have direct equivalents in other languages, leading to confusion or oversimplification.
- **Cultural Context:** Direct translation without cultural adaptation may miss important nuances, resulting in misunderstandings about treatment options or health beliefs.

3. AI-Powered Solutions

1. Real-Time Translation Tools

- Apps and devices (e.g., handheld translators) can convert speech or text into the patient's language almost instantaneously.
- While often helpful, these tools may struggle with slang, regional dialects, and highly specialized terminology.

2. Multilingual Chatbots

- Chatbots programmed with multiple languages can assist patients in booking appointments, understanding preparation instructions, or answering basic questions.
- They can free up clinical staff time, ensuring patients receive immediate support.

3. Hybrid Approaches

- Combining AI-driven translation with human oversight can balance efficiency and accuracy.
- Bilingual healthcare professionals can review AI outputs for critical nuances in diagnosis or consent forms.

4. Example from Practice

A community clinic serving a large immigrant population incorporates an AI-based translation platform. During intake, patients answer questions in their native language, which the system translates and logs in English for the physician. Nurses then verify key points to ensure accuracy, significantly reducing errors and improving patient satisfaction.

1.13.3 Unit 3: Using Generative AI for Medical Procedure Image Generation

1. Role of Visual Aids in Patient Education

Visuals, including diagrams and illustrations, can simplify complex medical information, enhancing patient comprehension. Particularly for patients with limited health literacy or language barriers, images can transcend linguistic differences.

2. *Generative AI for Medical Imagery*

1. **Customized Illustrations**

- AI models can produce tailored anatomical diagrams or step-by-step procedure visuals that reflect cultural or demographic considerations (e.g., showing skin tone variations).
- This customization can increase relatability and reduce patient anxiety.

2. **Culturally Adapted Explanations**

- AI can embed culturally specific cues, ensuring that visuals align with local beliefs and practices.
- For instance, an image demonstrating diabetic foot care might depict footwear common in the patient's culture.

3. **Interactive Elements**

- Some AI-driven platforms allow patients to explore 3D models of their condition, offering an immersive understanding of their medical situation.
- Interactive elements can promote engagement and lead to better self-care.

3. *Limitations and Considerations*

- **Accuracy of AI-Generated Content:** Generative models must be trained on high-quality medical data to avoid inaccuracies or misinformation.
- **Ethical Concerns:** De-identifying patient data and ensuring visual representations do not breach privacy is crucial.
- **Usability and Accessibility:** Older or low-tech patients may struggle with advanced digital formats, emphasizing the need for alternative explanations.

4. *Example from Practice*

A surgical department uses a generative AI platform to create a series of pre-operative illustrations for patients needing knee replacement surgery. Each image is adapted to the patient's language and cultural background, helping them visualize the procedure and post-operative exercises. Patient surveys indicate increased confidence and reduced anxiety, demonstrating the potential impact of AI-generated visuals on patient education.

- **Module 3 / Case Study 2: Medical Adherence**

Medical adherence is the degree to which patients follow medical advice, including taking medications as prescribed, attending follow-up appointments, and making lifestyle changes. It is a critical component of

effective healthcare, directly influencing outcomes, patient satisfaction, and system-wide costs. Despite its importance, medical adherence is a persistent challenge in healthcare systems worldwide. This module explores the barriers to adherence, the cultural and socioeconomic factors influencing it, and how AI technologies can offer practical solutions.

Unit 1: Overview of Challenges with Medical Adherence

Definition and Importance

Medical adherence is not merely about following instructions; it requires understanding, motivation, and trust. Non-adherence, whether intentional or unintentional, can lead to treatment failure, worsening of diseases, and higher rates of hospitalization. Estimates suggest that non-adherence rates for chronic disease medications are around 50%, even in developed countries (World Health Organization, 2003).

Key Challenges

1. Patient-Related Factors:
 - Lack of knowledge about the condition or treatment.
 - Emotional states like anxiety, fear, or denial about the illness.
 - Forgetfulness or confusion regarding medication schedules.
2. Systemic Issues:
 - Complex or poorly communicated treatment plans.
 - High costs of medication or limited insurance coverage.
3. Cultural and Social Influences:
 - Cultural beliefs can shape attitudes toward medication. For instance, patients in some cultures prefer natural remedies over pharmaceuticals, while others may question the need for long-term medication for asymptomatic conditions like hypertension.
4. Economic Disparities:
 - Patients in low-income settings may prioritise immediate needs like food and housing over purchasing medications.

Example from Practice

A 45-year-old hypertensive patient from a rural community misses medication doses due to a combination of illiteracy, inability to afford transportation to the clinic, and scepticism about modern medicine. These factors contribute to uncontrolled blood pressure and increased risk of cardiovascular complications.

Unit 2: AI Applications for Medication Support and Planning

The Potential of AI in Medical Adherence

Artificial intelligence provides innovative tools to help patients overcome barriers to adherence by addressing issues like education, reminders, and personalization. AI also supports clinicians by identifying patterns of non-adherence and suggesting targeted interventions.

AI-Powered Tools

1. Medication Reminders:

AI-driven mobile apps and wearable devices can send reminders tailored to a patient's schedule. For example, Medisafe offers medication tracking integrated with user-friendly alerts.

2. Chatbots for Patient Education:

Conversational AI tools can provide easy-to-understand instructions and address patient questions, improving understanding of treatment plans.

3. Predictive Analytics:

AI can analyze data from electronic health records and wearable devices to identify patients at risk of non-adherence. These insights allow clinicians to intervene before issues escalate.

Example from Practice

A diabetic patient uses an AI-enabled health app that tracks glucose levels via a wearable device. The system automatically adjusts medication reminders based on activity levels and meals, ensuring timely insulin use.

Limitations and Ethical Considerations

While AI offers powerful solutions, concerns about data privacy, equitable access, and over-reliance on technology must be addressed. For example, patients without smartphones may be excluded from AI interventions.

Unit 3: Fostering Trust in Medical AI

Importance of Trust

For AI to improve medical adherence effectively, patients and providers must trust the technology. Distrust can stem from fears of losing the personal touch in care or concerns about data misuse.

Barriers to Trust

1. Lack of Transparency:

Patients may not understand how AI tools function or make decisions, leading to skepticism.

2. Cultural Sensitivity:

AI tools designed without considering cultural nuances may feel impersonal or inappropriate.

3. Privacy Concerns:

Patients need reassurance that their health data will be securely managed and not used for unauthorized purposes.

Building Trust in AI

1. Transparent Communication:

Clearly explaining how AI complements care rather than replacing it can reduce anxiety.

2. Human-AI Collaboration:

Positioning AI as a support tool for clinicians rather than a replacement fosters acceptance.

3. Culturally Adapted Solutions:

Tailoring AI tools to respect language preferences and cultural norms enhances usability and trust.

Example from Practice

A multilingual AI chatbot used in a community clinic offers medication adherence support in local languages, adjusting its tone and examples to align with cultural practices. Patients report improved understanding and willingness to follow treatment plans.

Conclusion

Medical adherence remains one of the most significant challenges in healthcare, with complex barriers spanning cultural, economic, and systemic domains. While AI technologies cannot replace human interaction, they provide valuable support for improving adherence through personalized reminders, patient education, and predictive analytics. Building trust in these technologies is essential to ensure they are accepted and integrated into everyday healthcare practice. This module equips students with the knowledge to understand these challenges and explore AI's potential as a transformative tool for supporting doctor-patient interactions.

References

- Sabaté, E. (2003). *Adherence to Long-Term Therapies: Evidence for Action*. World Health Organization.
- Osterberg, L., & Blaschke, T. (2005). "Adherence to Medication." *New England Journal of Medicine*, 353(5), 487–497.
- Brown, M. T., & Bussell, J. K. (2011). "Medication Adherence: WHO Cares?" *Mayo Clinic Proceedings*, 86(4), 304–314.
- Kamal, S., et al. (2021). "Artificial Intelligence in Enhancing Medication Adherence." *Journal of Medical Systems*, 45(10).
- Gellad, W. F., & Thorpe, C. T. (2014). "The Challenges of Medication Nonadherence in the Elderly." *Clinical Geriatrics Medicine*, 30(2), 239–250.

Competencies:

1.14 1. General Competencies

- a) Advanced Digital Literacy
 Educators should demonstrate mastery in using digital tools and platforms relevant to healthcare education, including LMS systems, AI simulations, and telemedicine software.

b) **In-Depth Understanding of AI in Healthcare**
Educators must possess a conceptual and practical understanding of AI technologies used in healthcare communication, such as machine learning, NLP, and clinical decision support systems.

c) **Pedagogical Skills in Communication Training**
Teachers should be capable of conveying the role of communication in patient care to students, including best practices for empathy, cultural competence, and patient-centered dialogue.

1.15 2. Specific Competencies

a) **Designing and Evaluating AI Teaching Tools**
Educators should be able to select, adapt, and assess AI tools (e.g., chatbots, virtual patients, automated translation) to optimize student learning in simulated healthcare scenarios.

b) **Teaching Data Ethics and Privacy**
Instructors must confidently explain healthcare data privacy regulations (e.g., GDPR, HIPAA) and guide students in evaluating ethical risks of AI use.

c) **Diagnosing Learning Barriers Related to Communication**
Teachers should be able to identify where students struggle with empathy, communication clarity, or technology use—and design interventions accordingly.

1.16 3. Soft Competencies

a) **Mentoring Empathetic Communication with Technology**
Teachers should model and mentor the fusion of human empathy and technology-enhanced communication in simulations and real-world preparation.

b) **Facilitating Interdisciplinary Collaboration**
Educators should foster cross-functional teamwork among students from healthcare and technology backgrounds.

c) **Lifelong Learning and Innovation Facilitation**
Instructors must maintain a growth mindset, actively incorporating new AI developments and teaching methodologies.

Intended learning outcomes:

- Explain advanced AI concepts relevant to doctor–patient interaction, including NLP, decision support, and generative tools.
- Design lesson plans and learning activities that effectively teach communication challenges and AI solutions in healthcare.
- Evaluate student use of digital tools (e.g., chatbots, translators) in simulated healthcare interactions.
- Teach and assess data protection principles and regulatory frameworks (e.g., GDPR, HIPAA) in healthcare AI scenarios.
- Identify and address ethical dilemmas in doctor–patient–AI communication, including cultural sensitivity and transparency.

- Model and mentor empathetic and culturally aware communication strategies supported by AI tools.
- Facilitate interprofessional learning environments that promote collaboration between future medical and IT professionals.
- Critically appraise AI tools used in medical training and suggest improvements based on pedagogical goals.
- Guide students in reflecting on personal attitudes toward AI and its role in patient care.
- Adapt teaching strategies to accommodate diverse learner needs and evolving technologies.

Learning and teaching methods:

- Advanced Workshops and Microteaching Sessions
- Educators engage in simulated teaching scenarios using AI tools, followed by peer feedback to refine instructional methods and content delivery.
- Instructional Design Labs
- Teachers collaboratively design, test, and revise curriculum modules, focusing on integrating AI concepts and communication challenges.
- Ethics and Data Governance Seminars
- In-depth explorations of case studies involving real ethical dilemmas and data use in medical AI, with emphasis on facilitating student discussion.
- AI Tool Evaluation Practicums
- Hands-on sessions where educators assess the pedagogical value, risks, and usability of AI applications relevant to patient communication and adherence.
- Scenario-Based Pedagogical Simulations
- Teachers use complex, branching scenarios to learn how to manage class discussions on sensitive doctor–patient-AI topics.
- Peer Mentoring and Reflective Practice
- Structured peer-observation and coaching cycles, supported by reflection journals and group debriefs.
- Interdisciplinary Faculty Collaboration
- Co-teaching and curriculum design with IT and healthcare educators to promote integrated AI-health communication learning.
- Flipped Classroom for Educators
- Instructors prepare through guided study of AI pedagogy resources and apply concepts during collaborative design studios.
- Action Research Projects

- Educators develop and implement AI-integrated teaching strategies, then evaluate student outcomes and share findings.
- Guest Lectures and Industry Panels
- Opportunities to engage with leading AI developers and healthcare practitioners on current trends and challenges in the field.

Readings:

Mandatory readings

Ali, K., and B. Keskin Burcu. AI In Operations Management Applications Challenges and Opportunities. Journal of Data Information and Management 2, 2020.

Optional readings:

Katja, Hutter, et al. How AI Revolutionizes Innovation Management, Perceptions and Implementation Preferences of AI-based Innovators. Technological Forecasting and Social Change 178, 2022.

Evaluation

Weight (in %) **Assessment:**

50%	Written Assessment
50%	Oral Assessment

4.7 Using AI for personalized advertising campaigns

COURSE SYLLABUS	
Course title:	Using AI for personalized advertising campaigns

Study program and level	Study field	Academic school year	/ Semester
CVET/IVET	Digital Entrepreneurship, management, innovation management, digital marketing, communication, /	2.,3.	4.,6.

Course type	CVET
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University / school course code:	Unina, pic code:999976590
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Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
3	1			0,5	0,5	5

Lecturer:	
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Language of the Lectures:	English/ national language
Language of the Tutorial:	English/ national language

Prerequisites:

1. Teaching experience
2. Familiarity with marketing, communication and advertising
3. Problem-solving abilities
4. Critical Thinking abilities.

Content (Syllabus outline):

This syllabus describes the main elements, approaches, and tools that a teacher/trainer/mentor must implement for organizing and delivering a course on “AI potential for personalizing advertising campaigns”. The topics, the approaches, and tools are in line with the complexity and ever-changing trends that characterize the current advertising landscape. In doing so, the course has been organized around theoretical and practical activities, with a special focus on ethics and compliance challenges. The course has been designed to offer fundamental insights to teachers/trainers/mentors to efficiently and effectively approach the implementation of AI in advertising processes and activities.

The course offers theoretical and practical insights to support students in engaging customers through a personalized omnichannel communication. Finally, specific techniques and methods will be presented, focusing on specific methodologies, practical applications/tools, and real case studies.

Teachers/trainers/mentors will be able to practically implement the proposed frameworks and tools for supporting students in accessing or better approaching the current professional settings.

Module 1: Introduction to AI-based Advertising

This module offers an introductory overview of the challenges coming from the application of AI to advertising. It briefly explores AI potential for personalizing advs campaigns, defines the main capabilities and resources required to do this, and introduces the related challenges. By mastering these concepts and the related frameworks, and tools, teachers/trainers/mentors will offer to participants n valuable insights into approaching these technologies for organizing advertising campaigns.

Unit 1.1 Unlocking the Power of Personalization: How AI Transforms Your Customer Experience

This unit introduces the fundamental concepts of AI and how it is changing communication and the advertising domain thanks to the possibility of offering tailored experiences to real and potential customers by analyzing data, predicting behaviors, and creating highly targeted content. Teachers will support students in learning how AI technologies (e.g., machine learning and data analytics) are transforming ADV campaigns to process vast amounts of customer data to segment audiences and craft personalized and even more effective messages.

Unit 1.2 AI capabilities and resources for a successful advertising campaign

This unit presents and discusses the essential capabilities to successfully approach an AI-based advertising campaign. In doing so, teachers/trainers/mentors will support participants in recognizing which creative, analytical,

and technical skills are essential to design and execute AI-based advertising campaigns. In doing so, they will also focus on the role of Big Data and analytics in gathering insights about customer preferences, habits, and demographics to create highly targeted campaigns, how AI automates content creation, and media coverage to improve campaign efficiency and ROI. Some specific tools and concepts will be also briefly introduced and discussed, such as machine learning, natural language processing, and computer vision, focusing on their contribution to consumer behavior analysis, trends prediction, and content optimization.

Unit 1.3 Legal Frameworks, Compliance, and Ethical AI to avoid bias

This unit is dedicated to the legal and ethical implications of AI-based advertising, focusing on professionals' responsibility to make their campaigns compliant with data protection regulations and free from biases and discriminatory practices. Teachers/trainers/mentors will present and discuss together with participants the European key data protection laws (e.g., GDPR, General Data Protection Regulation) focusing on its implications for the design and implementation of AI-based advertising campaigns. Some practices and tools to avoid this potential negative impact on customer targeting, diversity, and fairness in advertising will be presented, supported by some best practices that demonstrate how to responsibly and ethically approach advertising, in terms of fairness, transparency, and accountability. The unit also offers some insights in terms of risk mitigation strategies and discriminatory outcomes prevention.

Module 2: AI for engaging customers and personalize communication

This module offers the knowledge, skills, and practical abilities to engage customers in personalized communication and advs campaigns, focusing on the potential of AI. By mastering these concepts and the related frameworks, and tools, teachers/trainers/mentors will offer to participants n valuable insights into approaching customer engagement and advs personalization, which are among the main drivers of companies' competitive advantage.

Unit 2.1 The digital consumer journey and AI-based real-time personalized AD campaign

This unit presents and discusses the core concept of customer journey and the main characteristics of its digital transformation. Dealing with this topic teachers/trainers/mentors will theoretically and practically support participants to recognize and approach the best approaches and tools for enhancing customers interactions with brands, contributing to their awareness, and equity. The unit emphasizes how AI (e.g., machine learning and predictive analytics) can track and influence each stage according to individual behaviors and preferences. In doing so, browsing history, social interactions, and past purchases will be considered to support lean decision-making pointing to dynamically adjusting advertisements to the changing customers' needs and wants. Teachers/trainers/mentors will support students offering a theoretical and practical approach to the Omni- and cross-channel integration (e.g., social media, digital platforms, websites, email) to design adaptive advertisement campaigns.

Unit 2.2 Personalization as a driver of customer loyalty

This unit offers an overall understanding of the importance of personalization for engaging customers in advertisement. Teachers/trainers/mentors will be presented and discussed with students specific strategies (e.g., tailored recommendations, dynamic content, and individualized offers), focusing on AI tools' ability/possibility to enhance customer experience by providing relevant, timely, and meaningful interactions. To approach in a strategic

way personalization, specific tools will be presented and used for managing the influence that psychological aspects have on customer loyalty (e.g., customer satisfaction, trust, emotional connection, etc.). The unit will also focus on the assessment of personalized advertisement campaigns; thus teachers/trainers/mentors will present and ask students to use some KPIs to assess advertising (e.g., such as customer lifetime value or CLV, retention rates, and net promoter scores or NPS).

Unit 2.3 Hybrid Approaches versus Real-world Applications: Tools in Advertising Platforms (Google, Meta, and Microsoft)

This unit offers a general overview of AI-driven hybrid approaches integration in advertising platforms to optimize customer engagement and personalization. Teachers/trainers/mentors will provide students with some examples and best practices to demonstrate how to gain and manage these approaches, focusing on the importance of merging machine learning, rule-based systems, and data-driven models. They will also support participants in dealing with specific methodologies and tools that make it possible to combine AI capabilities and traditional advertisement strategies to create effective and scalable campaigns. Teachers/trainers/mentors will also organize specific AI-driven tools that students can use and integrate with advertising platforms (Google Ads, Facebook Ads, programmatic advertising, etc.)

Module 3: Techniques and methods for AI-based personalized campaign

This module offers to teachers/trainers/mentors the skills, and practical abilities to engage customers in personalized communication and ads campaigns, focusing on the potential of AI. By mastering these concepts and the related frameworks, and tools, teachers/trainers/mentors will offer to participants valuable insights into approaching customer engagement and ads personalization, which are among the main drivers of companies' competitive advantage.

Unit 3.1 The role of data in an AI-based advertising campaign

This unit focuses on the critical importance of data in powering AI-driven advertisement strategies, offering a better understanding of how data underpins AI-based advertisement. Teachers/trainers/mentors will have the opportunity of collecting specific frameworks and tools to be used for supporting students in going through the personalization of AD messages and the optimization of targeting activities, customer behavior analysis. In doing so, Teachers/trainers/mentors will also be supported in approaching and organizing the theoretical and practical activities for supporting participants in managing customer data (demographics, preferences), behavioral data (website interactions, clicks), contextual data (device, location), and transactional data (purchase history).

Unit 3.2 Algorithms for Personalization, Collaborative Filtering in Personalization, and content-Based Filtering in Personalization

This unit offers to teachers/trainers/mentors an overview of the main techniques and AI algorithms they can approach with student for working on the creation of personalized ads experiences. The unit will also offer some insights about the how analyze users' data to recommend products, services, and content that align with individual preferences, enhancing user engagement and satisfaction (e.g., collaborative filtering, content-based filtering, hybrid recommendation systems).

Teachers/trainers/mentors an overview will be also supported by theoretical and practical material for presenting and managing with students some AI algorithm in specific real-world AD activities (e.g., product recommendation, content, or services creation, and possible performances).

Unit 3.3 How to leverage generative AI models and simulations for prediction - best practices

The unit offers to teachers/trainers/mentors an overview on how generative AI models and simulation tools can be implemented to predict customer behavior, campaign outcomes, and other key metrics. Some specific AI-based tools will be presented to make them able to support students in the predictive analysis, related for example to future advertising outcomes (e.g., Monte Carlo simulations, and agent-based modeling), supported by specific campaign scenarios, best practices, and synthetic data.

Competencies:

Specific competencies

- Pedagogical skills
- Didactic skills
- Education skills
- Teaching skills
- Planning and organization
- Adaptability
- Strategic thinking
- Risk management

Soft competencies

- Creativity
- Adaptability
- Critical thinking
- Problem-solving
- Communication
- Collaboration
- Team management
- Time management

- Interpersonal skills
- Leadership

Intended learning outcomes:

- Understanding and communicating the main principles at the core of advertising personalization
- Analyzing, recognizing and explaining the main legal frameworks, the importance of compliance, and an ethical approach to AI-based advertising
- Communicating the AI potential for AI for engaging customers and personalize communication
- Understanding, and applying the main techniques and methods for AI-based personalized campaign

Learning and teaching methods:

- Constructivist Approach
- Formative assessment
- Project-based learning
- Inquiry-based learning
- Cooperative learning
- Blended learning
- Experiential learning

Readings:

Mandatory readings

- Li, H. (2019). Special section introduction: Artificial intelligence and advertising. *Journal of advertising*, 48(4), 333-337.
- Argan, M., Dinç, H., Kaya, S., & Argan, M. T. (2022). Artificial Intelligence (AI) in advertising: Understanding and schematizing the behaviors of social media users. *ADCAIJ: Advances in Distributed Computing and Artificial Intelligence Journal*, 11(3), 331-348.
- Ford, J., Jain, V., Wadhvani, K., & Gupta, D. G. (2023). AI advertising: An overview and guidelines. *Journal of Business Research*, 166, 114124.

Huh, J., Nelson, M. R., & Russell, C. A. (2023). ChatGPT, AI advertising, and advertising research and education. *Journal of Advertising*, 52(4), 477-482.

Gao, B., Wang, Y., Xie, H., Hu, Y., & Hu, Y. (2023). Artificial intelligence in advertising: advancements, challenges, and ethical considerations in targeting, personalization, content creation, and ad optimization. *Sage Open*, 13(4), 21582440231210759.

Danesi, M. (2024). AI in Marketing and Advertising. In *AI-Generated Popular Culture: A Semiotic Perspective* (pp. 127-142). Cham: Springer Nature Switzerland.

Başev, S. E. (2024). The role of artificial intelligence (AI) in the future of the advertising industry: Applications and examples of AI in advertising. *International Journal of Education Technology and Scientific Researches*, 9(26), 167-183.

Vashishtha, S., & Sharma, P. (2025). Artificial Intelligence and More Effective Advertising: Unlocking the Power of Data and Automation. In *Advances in Digital Marketing in the Era of Artificial Intelligence* (pp. 162-171). CRC Press.

Wu, L., Dodoo, N. A., & Wen, T. J. (2024). Disclosing AI's Involvement in Advertising to Consumers: A Task-Dependent Perspective. *Journal of Advertising* 1-19.

Ahuja, K. (2025). AI and Advertising: Unraveling the Dynamics of Consumer Behavior and Brand Engagement. In *Advances in Digital Marketing in the Era of Artificial Intelligence* (pp. 1-6). CRC Press.

Optional readings:

Wu, L., & Wen, T. J. (2021). Understanding AI advertising from the consumer perspective: What factors determine consumer appreciation of AI-created advertisements?. *Journal of Advertising Research*, 61(2), 133-146.

Reis, L., Maier, C., & Weitzel, T. (2022, June). Chatbots in Marketing: An In-Deep Case Study Capturing Future Perspectives of AI in Advertising. In *Proceedings of the 2022 Computers and People Research Conference* (pp. 1-8).

Matthews, J., Fastnedge, D., & Nairn, A. (2023). The future of advertising campaigns: The role of AI-generated images in advertising creative. *Journal of Pervasive Media*, 8(1), 29-49.

Evaluation

Weight (in %)

Assessment:

50%	Assessment type 1 – final project work
35%	Assessment type 2 – quizzes
15%	Assessment type 3 – case analysis

4.8 AI in Market Research

COURSE SYLLABUS

Course title: AI in Market Research

Study program and level	Study field	Academic school year	Semester
	Marketing/	2.,3.	4.,6.

Course type: Professional Development

University / school course code:

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECT S
30	30				30	3-5

Lecturer:

Language of the Lectures: English/ national language

Language of the Tutorial: English/ national language

Prerequisites:

No prerequisites are needed in order to attend the course

Content (Syllabus outline):

This syllabus aims to equip the educators with the knowledge and practical tools to understand and teach the role of AI in Market Research. It introduces core AI concepts and their applications in market analysis while addressing ethical and privacy concerns. The educators will learn foundational principles, practical techniques, and real-world use cases of AI in market research, gaining deep understanding and pedagogical skills in various AI applications in market research, e.g., trend identification and sentiment analysis.

The following modules are especially emphasized:

Module A: Fundamentals of AI in market research

This module introduces educators to essential AI concepts and their transformative impact on market research. It emphasizes foundational methodologies and tools, showcasing how AI technologies enhance market data analysis and insights.

Unit A1: Introduction to AI concepts for market research

This unit will introduce the student with key concepts underpinning AI, including its aspects such as machine learning, NLP, and data mining in market research. Technologies can help bring in adaptive and innovative strategies which support decisions concerning market changes for business and product lines. Here, AI complementing and transforming classical methods of conducting market research studies with examples would be shown that are related to the successful operations of industries via AI.

Unit A2: Key terminology and tools in AI-driven market research

This unit examines key terminology and some of the main tools within AI-driven market research. Educators are then taken through how algorithms, neural networks, deep learning, and predictive analytics support insight generation, including practical use cases. Practical hands-on use would include key used tools such as data visualization platforms, predictive modeling software, and machine learning libraries. Through guided exercises, students will develop a practical understanding of how these tools can be used to analyze complex datasets and interpret key market trends.

Unit A3: Understanding data in market research

This unit covers the various types of data used in market research: qualitative data from interviews and focus groups, quantitative data from surveys, and unstructured data from sources like social media and customer reviews. Educators will learn the advantages and challenges associated with each type of data and how AI can streamline the collection, cleaning, and analysis of data. Real case studies will present actual examples of how AI is turning unstructured data into actionable insights, providing a complete view to participants regarding the value of AI in market research.

Module B: AI techniques for market analysis

Building on core concepts, this module delves into practical AI techniques for market analysis. It focuses on detecting trends, measuring consumer sentiment, and applying these insights to real-world scenarios.

Unit B1: Identifying market trends

This unit introduces the student to essential techniques for identifying and analyzing market trends using AI. Participants will explore methods such as time-series analysis, sales forecasting, and customer segmentation, gaining insights into how businesses can remain competitive by predicting market shifts. Practical exercises will involve analyzing historical datasets to develop a nuanced understanding of market trends and strategic opportunities. Real-world examples will demonstrate the integration of these techniques into broader marketing strategies.

Unit B2: Advanced techniques for market research

This unit will cover how AI technologies scan consumer sentiment using social media, online reviews, and even feedback from customers. Educators will be introduced to advanced methodologies such as NLP and machine learning algorithms for sentiment classification. There will be hands-on work with AI tools that measure brand perception, customer satisfaction, and emerging consumer trends. What this unit does is it focuses on the relevance of strategic importance in adapting marketing strategies according to customer needs and wants through the use of sentiment analysis.

Unit B3: Case studies in AI-driven market research applications

This unit presents a series of real-world case studies that showcase the successful application of AI techniques in market research. Educators will analyse how companies across various sectors have harnessed AI to enhance their research capabilities, yielding a deeper understanding of consumer behaviour and preferences. Case studies will cover instances where AI-driven insights have informed strategic decision-making, improved customer targeting, and optimised marketing initiatives. By critically reflecting on these examples, the students will be introduced to a rich understanding of the ways in which AI methodologies could be adapted to particular research objectives and dynamically applied to real-world contexts to enable business success.

Module C: Ethical and practical considerations in AI-driven market research

The critical ethical and practical dimensions related to the use of AI in market research will be discussed in this module, particularly focusing on how the process should be responsible and transparent. In this course, students will be introduced to the many complexities—from the ethical to data protection issues—developing a framework for applying AI technologies in ways that support consumer trust and regulatory standards. Through reviews of case studies and best practices, students will be introduced to the challenges and solutions that accompany ethical AI implementation in market research.

Unit C1: Case studies on ethical AI implementation

This unit introduces the student to real-world case studies on ethical dilemmas in AI applications, such as bias in algorithms and transparency in data usage. Participants will explore strategies for identifying and mitigating ethical risks while maintaining consumer trust. Through discussions and examples, students will gain a framework for implementing fair and transparent AI mechanisms aligned with industry norms and regulatory standards.

Unit C2: Privacy and data protection in AI applications

This unit examines privacy concerns and data protection regulations, with a focus on compliance with laws like the General Data Protection Regulation (GDPR). Educators will learn best practices for safeguarding consumer data,

including data anonymization, consent management, and secure storage protocols. Case studies will illustrate the consequences of privacy breaches and the measures organizations can adopt to prevent them.

Unit C3: Overcoming practical challenges in AI-driven market research: case studies and best practices

This unit presents case studies of organisations that have successfully integrated AI into their market research processes, despite facing significant challenges. Educators will be presented with the common obstacles such as data quality issues, technological limitations, and organisational resistance to change. In studying these cases, students will be shown how to overcome these challenges through best practices in data governance, creating an AI-ready organisational culture, and setting up processes for continuous monitoring and improvement. The unit emphasises how to create robust AI infrastructures which further market research capabilities and support long-term ethical and operational standards.

Competencies:

General competencies

1. Understanding ethical issues in AI

Identification and critical evaluation of ethical challenges associated with AI applications used in market research. For instance, technical challenges including algorithmic bias, and lack of transparency, and business challenges including the importance of building and maintaining customer/consumer trust.

2. Understanding data privacy concerns

Familiarisation and demonstrable awareness of data protection regulations (e.g., GDPR) and best practices for handling consumer data ethically and responsibly within market research contexts.

4. Applying AI to solve market research problems

Learning practical application of AI techniques (e.g., sentiment analysis, text mining, and predictive modeling) to address real-world problems of market research such as customer feedback analysis and market trend identification.

5. Integrating AI tools in workplace processes

Application of AI tools in practical business or educational settings to enhance research accuracy, decision-making, and overall productivity.

Specific competencies

1. Design Instructional Content on AI in Market Research

Creating engaging, interactive, curriculum-aligned lesson plans and learning activities that introduce students to the contents that are at the intersection of AI and market research.

2. Facilitate Inquiry-Based and Project-Based Learning

Implementation of classroom and learning strategies that encourage students to explore real-world data and solve problems using AI tools, fostering collaboration and critical thinking.

3. **Adapt AI Concepts to Different Learning Levels**

Adaptation of AI-related content that suits students with different learning abilities, ensuring accessibility and comprehension for all students.

4. **Promote Ethical Thinking and Digital Citizenship**

Developing a guideline for students to examine the ethical implications of AI in market research, including issues of bias, privacy, and responsible data use.

5. **Assess Educator Understanding of AI Concepts**

Developing both formative and summative assessments to assess student comprehension of AI technologies and their application in market research contexts.

Soft competencies

1. **Effective communication of AI insights:**

On one hand, clearly explaining AI concepts, methodologies, and insights to non-technical stakeholders in business or educational settings, and on the other hand, teaching students how to communicate technical findings of AI tools in a simplified and audience-appropriate way, using real-world examples and data storytelling techniques.

2. **Promoting ethical AI usage in organizations:**

On one hand, advocating transparency, fairness, and ethical standards in the implementation of AI in market research practices, and on the other hand, facilitating classroom discussions and design learning activities that help students critically explore the ethical implications of AI use, e.g., data bias, consent, and algorithmic audit.

3. **Adaptability to emerging AI technologies:**

On one hand, staying updated with emerging AI tools, techniques and evolving practices in market research, and demonstrating a proactive approach to learning and applying them, and on the other hand, modelling a growth mindset and encouraging students to engage with emerging technologies, integrating adaptive learning resources and flexible instructional strategies into the curriculum.

4. **Critical thinking and problem-solving:**

On one hand, analyzing complex market research challenges and creatively applying AI-based solutions to improve decision-making and business outcomes, and on the other hand, developing learning tasks that engage students in critical thinking to explore AI's applications in real-life contexts. For example, case-based learning, project-based assessments, or role-playing scenarios.

5. **Collaboration in AI-driven projects:**

On one hand, working effectively with interdisciplinary teams to design and implement AI-driven research strategies in market-focused environments, and on the other hand, developing guidelines for students to experience collaborative learning, e.g., group projects or discussions, that reflect real-world teamwork in AI and market research, fostering both peer learning and professional readiness.

Intended learning outcomes:**1. Design Learning Activities That Apply AI-Driven Analytics in Market Research**

The educators will be able to create instructional experiences where students use AI tools to enhance data collection, trend analysis, and decision-making, fostering a deeper understanding of market research practices.

2. Facilitate Educator Exploration of AI Techniques Like Sentiment Analysis and Predictive Modeling

The educators will be able to guide students in applying AI-powered methods to interpret consumer behavior, segment markets, and identify trends, supporting data-driven learning in marketing and business contexts.

3. Teach Ethical AI Practices and Data Privacy in Market Research

The educators will be able to develop and adapt curriculum components that help students recognize various ethical challenges in real-world applications of AI, e.g., bias, transparency, and consent to better understand data compliance requirements like GDPR.

4. Instruct Educators on AI-Enhanced Data Protection Techniques

The educators will be able to introduce students to concepts such as anomaly detection, data encryption, and anonymization in order to help them evaluate these strategies in the context of data ethics and consumer protection in market research.

5. Integrate AI-Driven Case Study Analysis into Classroom Practice

The educators will be able to design and facilitate critical analysis of real-world AI applications in market research, enabling students to draw actionable insights and make informed strategic recommendations.

6. Develop Educator Capacity to Forecast Market Trends Using AI

The educators will be able to implement learning specific modules where students use AI techniques, e.g., time-series analysis and clustering to predict market dynamics and assess business opportunities.

7. Support Educators in Communicating AI-Generated Insights Effectively

The educators will be able to help students practice translating complex AI findings into clear, persuasive narratives tailored for diverse consumer audiences, including non-technical stakeholders.

8. Model Adaptability by Integrating Emerging AI Tools into Instruction

The educators will be able to demonstrate a commitment to continuous learning by incorporating evolving AI tools into their teaching, and by encouraging students to stay curious and adaptable in a rapidly changing technological landscape.

9. Lead Collaborative, AI-Integrated Market Research Projects in the Classroom

The educators will be able to structure group-based learning experiences where students co-design, conduct, and analyze market research using AI tools, fostering teamwork, communication, and real-world problem-solving skills.

Learning and teaching methods:

1. Interactive Workshops

The educators will participate in guided, hands-on workshops using AI tools such as sentiment analysis platforms, predictive modeling software, and data visualization applications. These sessions are designed to model effective instructional strategies that can be replicated or adapted in their own classrooms.

2. Case Study Analysis

The educators will collaboratively examine real-world case studies illustrating successful and unsuccessful applications of AI in market research. These sessions will not only enhance analytical thinking but also equip teachers with case-based teaching materials and discussion techniques for classroom use.

3. Practice-Driven Assignments with Reflective Components

The educators will complete practical assignments involving real or simulated datasets, i.e., applying AI tools to draw insights, identify trends, and communicate findings. Each task will include a reflection component to help teachers consider how they might adapt similar assignments for their students.

4. Collaborative Group Projects

The educators will work in teams to design and execute an AI-driven market research project, simulating both professional collaboration and interdisciplinary teaching scenarios. Emphasis will be placed on developing co-teaching strategies, resource sharing, and peer feedback.

5. Guest Lectures

Industry professionals and AI practitioners will provide first-hand insights into current trends and tools in AI-driven market research. Following each session, participants will engage in guided discussions about how to translate these insights into age-appropriate classroom instruction and curriculum design.

6. Online Professional Learning Communities (PLCs)

The educators will join moderated online forums where they can share teaching ideas, ask questions, and collaborate across disciplines and institutions. These platforms will promote long-term peer support and exchange of instructional resources.

7. Simulated	Teaching	Scenarios	with	AI	Integration
<p>Through controlled, practice-based simulations, teachers will engage in market research tasks and then reflect on how to adapt the experience into student-facing scenarios. Simulations will focus on pedagogical decision-making, differentiated instruction, and classroom management of tech-based learning.</p>					
8. Self-Paced	Learning	Modules	with	Pedagogical	Extensions
<p>Self-guided modules will offer tutorials, readings, and curated videos that allow teachers to explore AI tools and concepts at their own pace. Each module will include suggestions for adapting the content into lesson plans or student activities.</p>					
9. Formative	Feedback	and	Reflective	Practice	
<p>Ongoing, constructive feedback from facilitators and peers will support the development of both technical and instructional competencies. Structured reflection activities will encourage teachers to assess their growth, identify learning gaps, and refine their teaching strategies accordingly.</p>					
<p>10. Continuous Learning Monitoring through Regular Knowledge Checks and Pedagogical Quizzes</p>					
<p>Periodic quizzes will help assess understanding of core AI concepts and pedagogical applications. These checks will not only reinforce content retention but also model formative assessment techniques teachers can use in their own classrooms.</p>					

Readings:

<p>Mandatory readings</p> <ol style="list-style-type: none"> 1. Siegel, E. <i>Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die</i>. Wiley, 2016. 2. Müller, V. C. (Ed.). <i>Ethics of Artificial Intelligence and Robotics</i>. Stanford Encyclopaedia of Philosophy, 2020. 3. Paliwal, M. N., and Nishita C. "AI in Market Research: Transformative Customer Insights - A Systematic Review." In <i>Exploring the Intersection of AI and Human Resources Management</i>, 231–255. December 2023. Link. 4. Haleem, A., Mohd, J., Mohd, A. Q., Rav,i P. S., and Rajiv, S. "Artificial Intelligence (AI) Applications for Marketing: A Literature-Based Study." <i>International Journal of Intelligent Networks</i> 3 (2022): 119–132. Link. 5. Ameen, N., Tarhini, A., Reppel, A., and Anand, A. "Customer Experiences in the Age of Artificial Intelligence." <i>Computers in Human Behavior</i> 114 (2021): 106548. Link. 6. Arora, N., Chakraborty, I., & Nishimura, Y. (2025). AI–Human Hybrids for Marketing Research: Leveraging Large Language Models (LLMs) as Collaborators. <i>Journal of Marketing</i> 0(0). Link <p>Optional readings:</p>

1. Ali, K., and B. Keskin Burcu. "AI In Operations Management: Applications, Challenges, and Opportunities." *Journal of Data Information and Management* 2 (2020).
2. Hutter, K., et al. "How AI Revolutionizes Innovation Management: Perceptions and Implementation Preferences of AI-Based Innovators." *Technological Forecasting and Social Change* 178 (2022).
3. *Journal of Marketing Research*. [Link](#).
4. McKinsey & Company. "Insights." [Link](#).
5. Harvard Business Review. [Link](#).
6. Journal of Marketing. [Link](#)

Evaluation

Weight (in %)

Assessment:

40%	Group project on AI-Driven Market Research
40%	Self-paced learning modules
20%	Presentation of case study analysis

4.9 AI in Customer Service - use of chatbots / virtual assistants and personalised suggestions

COURSE SYLLABUS	
Course title:	AI in Customer Service - use of chatbots / virtual assistants and personalised suggestions

Study program and level	Study field	Academic school year	/ Semester
	/	2.,3.	4.,6.

Course type

University / school course code:

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECT S
						5

Lecturer:

Language of the Lectures: English/ national language

Language of the Tutorial: English/ national language

Prerequisites:

No prerequisites are needed in order to attend the course

Content (Syllabus outline):

This course equips teachers/trainers with the skills to deliver AI in Customer Service content effectively to both IVET and CVET learners. It explores how to contextualize AI technologies within socio-economic, political, and technological frames, integrate hands-on practical exercises, and critically evaluate the pedagogical approaches for teaching AI applications.

1. Introduction to AI in customer service

1.1. Understanding AI in retail - why it is important? (CCIS)

Teachers will evaluate strategies for demonstrating the role of AI in retail through case studies, practical exercises, and discussions on operational efficiency, customer personalization, and inventory management. Emphasis will be placed on understanding how to use AI tools like TensorFlow, SAP, and Prsync for real-world applications.

1.2. The Role of chatbots and virtual assistants in customer engagement (GAIB)

Teachers should develop techniques to guide learners through chatbot creation, enhancement with AI, and evaluating engagement impacts. They will also design interactive activities to foster practical chatbot development and critical thinking.

1.3. Chatbots in customer Service (GAIB)

This topic focuses on teaching methods for enhancing chatbots with AI, analyzing customer service interactions, and facilitating learner-driven projects to simulate real customer service environments. Additionally, teachers will also learn how to create exercises where learners critically evaluate chatbot effectiveness and customer satisfaction outcomes.

1.4. Algorithms for personalized recommendations (Solvership)

Teachers will learn to instruct learners on collaborative filtering, content-based filtering, hybrid models, and deep learning applications, using real-world case studies and practical labs. They will also develop strategies to help learners compare different recommendation approaches based on business goals and customer data scenarios.

2. Designing AI-Powered chatbots for customer service

2.1. The power of virtual assistants in retail (Solvership)

Teachers will be trained on demonstrating the deployment and optimization of AI virtual assistants, embedding case studies, and facilitating tool implementation workshops to automate responses, personalize support, and assist customers with product searches and recommendations. Educators will also learn how to guide students in implementing virtual assistants within retail environments to enhance operational efficiency and customer satisfaction.

2.2. The relation between customer data and personalization (GAIB)

Teachers will learn how to guide students through customer data collection, loyalty strategy development, and the ethical implications of personalization by creating simulated brands and campaigns based on collected data. Strategies for managing big data and ensuring data-driven personalization to increase brand loyalty will also be discussed in depth.

2.3. Machine learning for customer insights (Solvership)

This topic prepares teachers to instruct on applying machine learning algorithms to analyze customer data, predict future behaviors, and offer custom-tailored services through hands-on case studies and real-world simulations. Additionally, participants will be trained to develop exercises where learners apply ML tools to practical retail challenges.

3. Advanced AI in customer service: personalization and data-driven approaches

3.1. AI performance metrics in customer service (Solvership)

This course delivers methods for designing lessons that explore key AI performance indicators, interpretation of metrics, and critical performance evaluation exercises. Moreover, teachers will learn to develop assignments where learners critically assess the efficiency and effectiveness of AI applications in various customer service scenarios.

3.2. Future insights on how AI will shape retail customer service (CCIS)

Teachers will be trained to incorporate future trends analysis, innovative applications like dynamic pricing and omnichannel strategies, and foster strategic thinking through predictive scenarios. This unit topic also prepares teachers to engage learners in forward-thinking projects analyzing AI's evolving role in retail.

3.3. Case studies: AI applications that customers encounter while shopping (CCIS)

This topic provides strategies for using real-world case studies (e.g., Amazon, Sephora) to inspire applied learning, critical assessment, and innovation projects among learners and teachers. Teachers will be encouraged to have students propose new AI-driven solutions based on gaps or opportunities identified within the case studies.

Competencies:

General competencies

- Plan and deliver AI-focused teaching sessions
- Design learning activities for hands-on AI tool application
- Analyze and adapt AI case studies for teaching purposes
- Guide learners in evaluating the impact of AI tools
- Foster critical thinking about AI's socio-economic influence

Specific competencies

- Develop activities for chatbot and virtual assistant creation
- Teach algorithm selection for recommendation systems
- Design exercises for AI-driven customer personalization
- Guide learners in the use of machine learning for insights
- Critically assess and guide discussion on ethical AI use

Soft competencies

- Communicate complex AI concepts clearly
- Foster learner autonomy and creativity
- Adapt teaching to technological advances
- Facilitate team collaboration and problem-solving
- Cultivate reflective and ethical perspectives on AI

Intended learning outcomes:

- Analyze the socio-economic context of AI in customer service
- Design effective lesson plans to teach AI tools in retail environments
- Develop hands-on activities for AI-powered customer engagement systems
- Evaluate AI performance metrics and guide students in interpreting them
- Implement project-based learning to teach recommendation algorithms
- Facilitate critical discussions on AI personalization and ethical considerations
- Demonstrate practical applications of AI technologies through real-world case studies
- Adapt emerging AI technologies into teaching strategies
- Create integrative learning experiences combining technical AI skills with customer service strategies

Learning and teaching methods:

- Interactive lectures
- Practical workshops
- Case study analyses
- Group projects

- Simulation exercises
- Reflective journals
- Peer teaching
- Critical discussion forums

Readings:

Mandatory readings

Ali, K., and B. Keskin Burcu. AI In Operations Management Applications Challenges and Opportunities. Journal of Data Information and Management 2, 2020.

Optional readings:

Katja, Hutter, et al. How AI Revolutionizes Innovation management, Perceptions and Implementation Preferences of AI-based Innovators. Technological Forecasting and Social Change 178, 2022.

Evaluation

Weight (in %)

Assessment:

Weight (in %)	Assessment:

4.10 AI-Driven Inventory and Logistics Automation

COURSE SYLLABUS							
Course title:		AI-Driven Inventory and Logistics Automation					
Study program and level		Study field			Academic school year		Semester
		/					
Course type							
University / school course code:							
Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECT S	
Lecturer:							
Language of the Lectures:		English/ national language					
Language of the Tutorial:		English/ national language					

Prerequisites:

No prerequisites are needed in order to attend the course

Content (Syllabus outline):

The course aims to equip teachers with essential skills in using AI systems for automating inventory and logistics processes in the wholesale and retail trade sector. By focusing on machine learning, data pipeline creation, and supply chain optimization, teachers will understand how AI systems can improve operational efficiency, stock management, and fraud detection. This structure aligns with the industry needs for wholesale and retail trade, focusing on practical AI applications in inventory and logistics.

The following modules and units are especially emphasized:

- **Module 1: Introduction to AI Systems in Inventory Management**

- o Understanding AI and its role in supply chain operations

An introduction to the fundamental concepts of Artificial Intelligence (AI) and its transformative influence on supply chain operations is given. Teachers will examine how AI enhances decision-making, efficiency, and responsiveness in areas such as inventory management, procurement, and logistics. The unit will cover essential AI technologies, including machine learning, natural language processing, and automation, emphasizing their role in optimizing processes, reducing costs, and enhancing overall supply chain performance.

- o AI Systems for Inventory Forecasting

The role of AI in demand forecasting and inventory management is explored. AI-driven systems leverage historical data, real-time market trends, and predictive analytics are examined to foresee future demand, minimize stockouts, reduce excess inventory, and optimize stock levels. Participants will gain valuable insights into various AI models and algorithms employed for precise forecasting and inventory optimization.

- o Practical applications of AI in wholesale and retail trade

Real-world applications of AI within the wholesale and retail sectors are discussed. By examining various case studies and examples, teachers will gain insights into how AI is utilized for product recommendations, automated replenishment, dynamic pricing, and analyzing customer behavior. The unit highlights the transformative impact of AI solutions on inventory management, customer experience enhancement, and profitability within these industries.

- **Module 2: Implementing AI tools for inventory management**

- o Building and using data pipelines in ai-driven inventory systems

Teachers will explore the critical role of developing and sustaining robust data pipelines for AI-driven inventory management. The topics covered will include the collection, processing, and integration of various data sources, such as sales data and market trends, to support AI algorithms. This unit highlights the importance of data

pipelines in maintaining accurate, timely, and clean data flow, which is essential for effective AI model training and real-time decision-making.

- Machine learning models for stock optimization

The application of machine learning (ML) models for optimizing stock levels is explored. Participants will examine various ML algorithms designed to predict inventory levels, optimize reorder points, and align supply with demand. Key techniques such as classification, regression, and clustering will be covered, illustrating how they enhance stock accuracy, minimize holding costs, and prevent both stockouts and overstocking within inventory management systems.

- Integration of AI tools with proprietary and open-source inventory systems

The integration of AI tools with both proprietary and open-source inventory management systems is explained. Teachers will investigate best practices for seamlessly incorporating AI algorithms and models into existing infrastructures, whether they are custom-built or sourced from open platforms. The unit addresses technical integration challenges, interoperability, and system customization, facilitating a smooth adoption of AI that enhances the functionality of traditional inventory systems.

– **Module 3: Enhancing supply chain visibility and efficiency with AI Systems**

- AI-Driven supply chain optimization

The ways in which AI enhances visibility and efficiency within the supply chain by optimally managing various operations, including procurement, transportation, and warehousing are addressed. Teachers will examine how AI tools such as predictive analytics, route optimization, and real-time tracking contribute to improved decision-making, reduced lead times, and lower costs. Additionally, the unit addresses the role of AI in demand planning, inventory allocation, and enhancing supply chain resilience.

- Digital security and transaction analysis in the retail sector

The significance of digital security in AI-driven supply chains, with a focus on the retail sector is explored. Participants will gain insights into how AI tools analyze transaction data to identify fraud, ensure compliance, and safeguard sensitive information. Key topics include cybersecurity measures, data encryption, and AI-based anomaly detection, all designed to protect retail operations.

- Case studies in AI-enabled supply chain success

Real-world case studies that demonstrate the successful integration of AI in supply chain management are presented. Teachers will examine examples from diverse industries, showcasing how AI systems have enhanced efficiency, improved visibility, and delivered cost savings along with superior customer service. The unit offers valuable insights into best practices and key lessons learned from transformations driven by AI in the supply chain.

Competencies:

General competencies

- Understand the principles and applications of Artificial Intelligence (AI) in inventory and supply chain management, including key terminology, concepts, and real-world use cases relevant to vocational education.

- Develop digital literacy and technical proficiency in using AI-powered inventory management systems, including data input, basic analysis, system navigation, and working with both proprietary and open-source AI platforms.
- Analyze and solve supply chain and inventory management problems using AI tools and techniques, applying data-driven methods to propose and evaluate effective solutions.
- Interpret AI-generated data and analytics to support informed decision-making related to inventory control, demand forecasting, and logistics operations.
- Integrate and manage data pipelines to ensure accurate and efficient data flow, supporting the operation of AI-driven inventory and logistics systems.
- Collaborate and communicate effectively in team settings, guiding and supporting the adoption and implementation of AI technologies in educational and industry-related contexts.
- Adapt to emerging AI tools and technologies, maintaining readiness to operate in rapidly evolving digital environments and supporting ongoing innovation in vocational education and practice.
- Make strategic and operational decisions based on AI insights to improve supply chain efficiency, inventory optimization, and overall business performance.
- Lead the implementation of AI solutions within supply chain operations, fostering a culture of continuous improvement and promoting digital transformation in educational and professional settings.

- **Specific competencies**
- Apply fundamental AI concepts to practical inventory management tasks such as tracking stock levels, predicting demand, and supporting replenishment strategies.
- Understand how machine learning models function in inventory optimization, including their role in demand forecasting and waste reduction.
- Collect, input, and manage data within AI systems, and interpret outputs to support decision-making in inventory control and logistics.
- Operate entry-level to advanced AI software and platforms, navigating interfaces and using core functionalities for inventory tracking, stock ordering, and supply chain management.
- Identify and evaluate areas in supply chain operations where AI can enhance performance—such as inventory accuracy, automated processes, and logistic efficiencies.
- Use AI-based decision-support tools for routine operations and strategic planning, improving efficiency and responsiveness in supply chain workflows.
- Design, train, and implement machine learning models tailored to inventory management needs, including stock optimization and managing supply chain variability.
- Build and manage complex data pipelines, ensuring accurate, timely, and secure data flow into AI-driven inventory and logistics systems.
- Apply AI tools for strategic forecasting and predictive analytics, enabling improved inventory planning, procurement efficiency, and real-time operational decisions.

- Implement AI-driven optimizations in diverse supply chain areas such as route planning, real-time tracking, procurement, and logistics automation.
- Enhance digital security and manage risks using AI, including detecting fraud and protecting sensitive data in inventory and supply chain operations.
- Lead and support organizational change by guiding teams through the integration and adoption of AI technologies in inventory and logistics processes.
- Analyze real-world case studies of AI implementation, drawing actionable insights to inform and improve their own instructional and operational strategies.

Soft competencies

- Adapt to technological change, demonstrating flexibility and openness in adopting AI systems and other digital tools in supply chain and inventory management.
- Foster a mindset of curiosity and lifelong learning, staying engaged with ongoing advancements in AI and exploring new applications across logistics and inventory processes.
- Demonstrate attention to detail, ensuring accuracy in data inputs, outputs, and AI-generated inventory forecasts to support reliable decision-making.
- Manage time and tasks effectively, maintaining timely updates of AI systems and efficient monitoring of stock and supply chain activities.
- Communicate and collaborate within teams, contributing to the implementation of AI-driven solutions and promoting smooth coordination in logistics environments.
- Work across diverse teams, clearly conveying complex AI-driven insights to both technical and non-technical stakeholders.
- Think critically and solve problems, using AI tools and data to troubleshoot basic and advanced challenges in inventory and logistics operations.
- Exhibit strategic thinking, leveraging AI-generated insights to make informed, forward-looking decisions that enhance supply chain performance.
- Lead and manage change, guiding colleagues through the integration of AI systems and encouraging adoption through effective leadership and support.
- Mentor and share knowledge, promoting a culture of continuous improvement and innovation by helping peers understand and use AI tools effectively.
- Build resilience and flexibility, responding constructively to issues such as AI integration difficulties, data inconsistencies, or supply chain disruptions.
- Demonstrate a proactive attitude toward improvement, seeking and suggesting AI-based innovations to optimize processes and boost overall efficiency.
- Understand and apply ethical principles, ensuring responsible AI use with attention to data privacy, transparency, and accountability in inventory and logistics systems.

Intended learning outcomes:

- Describe the role of Artificial Intelligence (AI) in supply chain and inventory management, explaining how it enhances efficiency, decision-making, cost-effectiveness, and service quality in wholesale and retail trade.
- Identify and explain key AI technologies such as machine learning, automation, and predictive analytics, and articulate their impact on logistics, inventory control, procurement, and purchasing processes.
- Apply AI-driven forecasting models to predict inventory demand using historical data, seasonal trends, and consumer behavior patterns.
- Use machine learning techniques (e.g., regression, classification) to optimize stock levels, improve order accuracy, and minimize overstock or shortages in inventory systems.
- Construct, develop, and manage data pipelines that collect, process, and integrate real-time and historical data to support AI-powered logistics and inventory systems.
- Integrate AI tools and platforms—both proprietary and open-source—into existing inventory systems, addressing issues of technical compatibility, scalability, and implementation challenges.
- Leverage AI technologies to enhance supply chain visibility, support route and logistics planning, reduce operational costs, and improve procurement and demand forecasting decisions.
- Implement AI tools for digital security, including fraud detection, transaction anomaly identification, and the protection of sensitive customer and payment data.
- Analyze practical, real-world applications of AI in wholesale and retail trade (e.g., dynamic pricing, customer analytics, and automated inventory systems), demonstrating understanding through case-based learning.
- Evaluate and synthesize lessons from case studies of successful AI adoption in supply chains, identifying best practices, key success factors, challenges, and opportunities for replication and adaptation in educational and professional contexts.

Learning and teaching methods:

The course can include the following learning and teaching methods:

- Problem-Based Learning (PBL); In this pedagogical model, teachers are confronted with intricate, real-world challenges in inventory management and supply chain logistics that necessitate the application of AI-driven solutions. This methodology promotes critical thinking and the practical application of advanced concepts in artificial intelligence.
- Work-Based Learning; This approach enables teachers to implement their AI knowledge within their existing work environments through projects or assignments that are directly pertinent to their professional roles. Such relevance enhances skill application in real-time contexts.
- Case Study Analysis; This involves a thorough examination of real-world case studies showcasing successful AI implementations within inventory and logistics frameworks. Teachers critically analyze these

cases, identify best practices, and engage in discussions on how analogous strategies could be effectively instituted within their own organizations.

- Workshops on Advanced AI Tools; These hands-on workshops focus on the utilization of advanced AI tools, including machine learning models for demand forecasting and the construction of data pipelines. Participants gain invaluable practical experience and technical training in these areas.
- Seminars and Expert Lectures; Led by industry experts or AI professionals, these sessions impart the latest trends, insights, and emerging technologies related to AI-driven inventory and supply chain management, thereby enriching the teachers' knowledge base.
- Collaborative Projects with Cross-Functional Teams; In this collaborative format, teachers engage in teamwork with individuals from diverse departments to address AI-driven supply chain challenges. This structure fosters interdisciplinary collaboration and deepens their understanding of AI's broader implications.
- Blended Learning (Online and Face-to-Face); This instructional design combines online self-paced learning modules with face-to-face or virtual workshops, thus offering a flexible educational experience that accommodates the complexities faced by adult teachers who must balance work and study commitments.
- AI Tool Integration Simulations; Participants engage in simulated exercises that involve the integration of AI tools into pre-existing inventory management systems. These simulations allow teachers to practice overcoming integration challenges while working with both proprietary and open-source systems.
- Reflective Practice and Continuous Feedback; Teachers maintain a reflective journal or portfolio to document their experiences in implementing AI solutions, analyze outcomes, and receive ongoing feedback from mentors or instructors, thereby fostering a cycle of continuous improvement.
- Leadership and Change Management Training; This component includes workshops and courses tailored to develop leadership skills essential for managing AI-driven organizational change. Topics include strategies for guiding teams through technological transitions and promoting innovation in supply chain management.

Readings:

Mandatory readings:

- Woschank, M., Rauch, E., & Zsifkovits, H. (2020). A Review of Further Directions for Artificial Intelligence, Machine Learning, and Deep Learning in Smart Logistics. *Sustainability*. <https://doi.org/10.3390/su12093760>.
- Pournader, M., Ghaderi, H., Hassanzadegan, A., & Fahimnia, B. (2021). Artificial intelligence applications in supply chain management. *International Journal of Production Economics*, 241, 108250. <https://doi.org/10.1016/j.ijpe.2021.108250>.
- Tang, Y., Chau, K., Lau, Y., & Zheng, Z. (2023). Data-Intensive Inventory Forecasting with Artificial Intelligence Models for Cross-Border E-Commerce Service Automation. *Applied Sciences*. <https://doi.org/10.3390/app13053051>.

- Singh, N. (2023). AI in Inventory Management: Applications, Challenges, and Opportunities. *International Journal for Research in Applied Science and Engineering Technology*. <https://doi.org/10.22214/ijraset.2023.57010>.
- Singh, N. (2023). AI and IoT: A Future Perspective on Inventory Management. *International Journal for Research in Applied Science and Engineering Technology*. <https://doi.org/10.22214/ijraset.2023.57200>.
- Li, Q. (2021). Inventory Method of Intelligent Logistics Warehouse Based on Artificial Intelligence. *Journal of Physics: Conference Series*, 2037. <https://doi.org/10.1088/1742-6596/2037/1/012102>.
- Lingam, Y. (2018). The role of Artificial Intelligence (AI) in making accurate stock decisions in E-commerce industry. *International Journal of Advance Research, Ideas and Innovations in Technology*, 4, 2281-2286. <https://www.ijariit.com/manuscript/the-role-of-artificial-intelligence-ai-in-making-accurate-stock-decisions-in-e-commerce-industry/>

Optional reading:

- Vasiliki, S., & Apostolos, P. (2023). AI Technology in the Field of Logistics. *2023 18th International Workshop on Semantic and Social Media Adaptation & Personalization (SMAP)18th International Workshop on Semantic and Social Media Adaptation & Personalization (SMAP 2023)*, 1-6. <https://doi.org/10.1109/SMAP59435.2023.10255203>.
- Foster, M., & Rhoden, S. (2020). The integration of automation and artificial intelligence into the logistics sector. *Worldwide Hospitality and Tourism Themes*. <https://doi.org/10.1108/whatt-10-2019-0070>.
- Foster, M., & Rhoden, S. (2020). The integration of automation and artificial intelligence into the logistics sector. *Worldwide Hospitality and Tourism Themes*. <https://doi.org/10.1108/whatt-10-2019-0070>.
- Zdravković, M., Panetto, H., & Weichhart, G. (2021). AI-enabled Enterprise Information Systems for Manufacturing. *Enterprise Information Systems*, 16, 668 - 720. <https://doi.org/10.1080/17517575.2021.1941275>.

Evaluation

Weight (in %)

Assessment:

50%	Project-based coursework
50%	Oral or written exam

