AI4VET4AI

AI-powered next generation of VET

Co-funded by
the European Union

Project 101104579

D4.1: Curricula for IVET and CVET learners on AI-related skills

Partner:	Solvership (PI)
Work Package:	Work package 4: Curriculum/syllabus development for AI skills in VET
Task:	Task 4.1: Devising curricula for IVET and CVET learners on AI-related skills
Due date:	14/07/2025
Work package Leader:	Solvership (PI)

Start date of project: 15 June 2023 **Duration:** 48 months

DOCUMENT HISTORY		
Version	**Date**	**Changes**
1.1	11/07/2025	**First version of the document.**
2.1	14/07	**Final version of the document.**

DISSEMINATION LEVEL		
PU	Public, fully open	X
SEN	Sensitive (limited under the GA conditions)	
CLASS	EU classified, confidential	

Co-funded by the European Union

MAIN AUTHORS	
Name	**Organisation**
Tomislav Hlupić	Solvership (PI?

QUALITY REVIEWERS	
Name (Quality Reviewer 1, Quality Reviewer 2)	**Organization**
Maja Brkljačić, Elena Pavić	Algebra University (AU)

LEGAL NOTICE

The information and views set out in this report are those of the authors and do not necessarily reflect the official opinion of the European Union. Neither the European Union institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the information contained therein.

© AI4VET4AI Consortium, 2023

Reproduction is authorised provided the source is acknowledged.

Co-funded by
the European Union

TABLE OF CONTENTS

Co-funded by the European Union

Co-funded by
the European Union

Executive summary

This deliverable presents a collection of curricula specifically designed to equip IVET (Initial Vocational Education and Training) and CVET (Continuing Vocational Education and Training) learners with practical, sector-relevant skills in artificial intelligence (AI). These curricula were developed within the framework of the AI4VET4AI project, which aims to bridge the emerging AI skills gap in vocational education and ensure that learners across Europe are prepared for the digital transformation of the labour market.

The development process was highly collaborative and grounded in evidence. It began by identifying five industry sectors where AI has high potential for transformation and where skill shortages are most prominent: (1) Professional, Scientific and Technical Activities, (2) Wholesale and Retail Trade, (3) Human Health and Social Work, (4) Education, and (5) Accommodation and Food Services. Based on initial stakeholder input and research insights from previous work packages, the consortium proposed a set of relevant course topics and refined them through iterative partner discussions and alignment with pedagogical priorities.

A total of ten curriculum topics were developed, each available in IVET and CVET formats. These cover a broad range of domains, including AI in customer service, logistics automation, healthcare communication, tourism sustainability, advertising, and market research. The courses are designed with a learner-centered approach, using practical use cases, real-world tools, and inclusive teaching strategies. Each curriculum includes core AI concepts, applications specific to the relevant industry, ethical and legal considerations, and assessment methodologies.

All curricula were developed using a uniform template, allowing for consistency in learning outcomes, skill categorization (general, specific, and soft skills), and pedagogical strategies. The development process included structured partner contributions, feedback loops, and alignment with European competency frameworks such as DigComp, EntreComp, and LifeComp.

These AI-focused curricula represent a concrete step toward modernizing VET systems and equipping learners with not just technical competencies, but also the ability to navigate and adapt to the socio-ethical dimensions of AI technologies in the workplace. The annex of this deliverable provides the full versions of all ten IVET and CVET curricula.

Co-funded by
the European Union

1. Introduction

Work Package 4 (WP4) of the AI4VET4AI project is dedicated to designing and delivering educational content and methodologies that enable both learners and educators within vocational education and training (VET) to acquire AI-related skills. Within this work package, Task 4.1 focused on the development of curricula for IVET and CVET learners in selected industries, resulting in this deliverable.

The overarching aim of this task was to produce a coherent set of curricula tailored to the realities of the VET landscape, while anticipating the evolving demands of the AI-powered labour market. The process began with a foundational step: identifying industries with a strong need for AI-related competencies and practical application. This decision was informed by previous research findings from WP2 and early insights from WP3.

The five chosen industries were:

- Professional, Scientific and Technical Activities (including accounting, advertising, market research)
- Wholesale and Retail Trade
- Human Health and Social Work
- Education
- Accommodation and Food Services

These sectors were selected based on their digitalization potential, documented skills shortages, and existing AI use cases. In each industry, project partners proposed topic areas where AI could be effectively integrated into the VET curriculum. To assign partners to industry-specific course development, a survey was conducted across the consortium using a Likert scale. Partners ranked their preferred industries, and assignments were made based on the overall alignment of preferences, expertise, and institutional capacity. Educational institutions, particularly universities, were prioritized as course leads where applicable.

Once working groups were formed and responsibilities distributed, partners proposed specific course topics. These proposals were analysed using keyword clustering to identify common themes and define ten final curriculum topics. Each topic was then assigned to a responsible lead partner with experience in both AI and curriculum development. This ensured a solid foundation for pedagogical quality and domain expertise.

The curriculum development process followed a shared and collaborative methodology. Partners worked in a common digital environment and used a standardized syllabus template. All curricula include the following components:

- General, specific, and soft competencies
- Intended learning outcomes
- Modular course structures with suggested units
- Recommended teaching and assessment methods
- Suggested reading materials (mandatory and optional)

Importantly, while each course is domain-specific, they all begin with a foundational unit introducing the basics of AI. This consortium-wide decision ensures that all learners gain consistent exposure to core AI principles such as:

- What is AI?
- Common applications of AI
- Ethical considerations in AI

Co-funded by the European Union

This introductory unit helps scaffold the learning experience regardless of the learner's background or vocational path.

The initial development focused primarily on IVET curricula, with CVET versions drafted in parallel and further refined using feedback from IVET evaluations. Each partner contributed to the development of modules and units based on their expertise. Content creation was iterative, with quality assurance provided by the task leads and peer feedback built into the review cycles.

This structured and iterative development process has ensured that the resulting curricula are not only aligned with the demands of the digital economy, but also grounded in pedagogical best practices. The next section of this deliverable provides an overview of the process in greater detail, followed by summaries of each curriculum and full versions in the annex.

Co-funded by
the European Union

2. Curricula summaries

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

2.1.1 IVET curriculum summary

This course is designed for IVET learners in hospitality and accommodation and aims to equip them with essential knowledge and practical skills in applying AI to customer relationship management (CRM). Students begin by learning CRM fundamentals and how high-quality data is crucial for AI applications. They explore real-life applications of AI in hospitality, practice predictive analytics, sentiment analysis, and recommendation systems, and work on customizing customer experiences using AI tools. Privacy, GDPR compliance, and ethical AI use are emphasized to foster responsible innovation. The course applies Project-Based Learning and hands-on use of AI tools, enabling students to develop strategic, technical, and interpersonal competencies for AI-enhanced CRM.

2.1.2 CVET curriculum summary

This course for CVET learners focuses on applying AI tools to improve CRM processes in the hospitality industry. It covers key CRM principles, AI integration, data management, and automation, with practical use cases tailored to real-world scenarios. Learners develop competencies in using AI for customer segmentation, predictive modelling, personalization, and sentiment analysis. The curriculum emphasizes privacy, ethics, and data security while fostering teamwork and problem-solving. With a strong focus on hands-on practice, the course prepares participants to implement AI-driven CRM strategies that enhance service quality and customer satisfaction.

2.2 Using AI for Understanding Tourism Impact and Improving Sustainability

2.2.1 IVET curriculum summary

This IVET course explores how AI can enhance sustainable tourism by analysing its economic, social, and environmental impacts. Students gain foundational knowledge of AI technologies and their ethical use in tourism, including data privacy and bias. Through modules on trend analysis, business decision-making, and sustainability, learners apply AI tools to optimize resource use, personalize customer experiences, and tackle overtourism. The course emphasizes real-world case studies and hands-on activities, encouraging students to develop AI-driven strategies for responsible tourism. By the end, learners will be able to use AI to support strategic planning and improve both customer engagement and sustainability outcomes.

Co-funded by the European Union

2.2.2 CVET curriculum summary

Designed for CVET learners in tourism, this course focuses on how AI can be applied to improve business performance and promote sustainable practices. Participants study AI's role in trend recognition, impact assessment, and operational cost optimization, particularly in tourism settings. The curriculum blends theoretical foundations with practical applications, offering use cases and data-driven tools for forecasting, personalization, and environmental monitoring. Ethical and legal issues related to AI implementation are also covered, helping learners understand responsible innovation. By completing the course, learners will be able to apply AI in real-world tourism contexts to enhance sustainability, customer experience, and operational efficiency.

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

2.3.1 IVET curriculum summary

This IVET course introduces students to fundamental AI principles with a strong focus on personalized learning, ethical awareness, and digital self-management. It provides practical experience with AI tools for academic feedback, task automation, and collaborative teamwork. Students explore how to apply AI insights to develop study strategies, manage time effectively, and work in teams using AI-supported collaboration tools. Creative thinking is fostered through gamified learning and AI-driven simulations, helping students engage in interactive, real-world problem-solving scenarios. The course also prepares students for future careers by introducing the evolving role of AI across industries, with particular attention to privacy, ethical regulation, and the EU AI Act.

2.3.2 CVET curriculum summary

Targeted at adult and continuing learners, this CVET course equips participants with the ability to use AI for optimizing learning and professional development. It begins with AI fundamentals and explores how to customize learning paths using recommendation systems, LLMs, and data insights. Learners practice using AI tools for academic planning, time and task management, and collaborative learning, helping improve study efficiency and teamwork. The course emphasizes ethical AI use in education, including data privacy and responsible deployment. Through interactive assignments and a culminating project, learners apply AI for self-improvement, professional training, and gamified educational content design, preparing them to adapt to evolving AI-driven workplaces.

2.4 Human-AI Collaboration in Teaching and Learning

2.4.1 IVET curriculum summary

This IVET course prepares future educators to effectively integrate AI tools into teaching and learning environments while fostering critical understanding of ethical, pedagogical, and technological implications. Through three modules, students explore foundational AI concepts, the use of AI for assessment and personalized learning, and the design of adaptive systems. Learners gain hands-on experience with tutoring systems, chatbots, and learning analytics tools, while also reflecting on the evolving roles of teachers and AI. Emphasis is placed on responsible AI use,

Co-funded by the European Union

including fairness, transparency, and data privacy, guided by ethical frameworks. The course combines workshops, role-playing, and project-based learning to develop both technical and human-centered teaching strategies for AI-supported classrooms.

2.4.2 CVET curriculum summary

This CVET course is designed to equip current educators and adult learners with the knowledge and practical skills needed to thrive in AI-enhanced teaching environments. It introduces AI-assisted teaching tools, explores adaptive learning systems, and addresses ethical and pedagogical considerations essential for responsible integration. Participants gain insight into AI-powered feedback, assessment systems, and data analytics, enabling them to identify learning patterns and improve educational outcomes. The course also encourages critical reflection on human-AI collaboration, supporting inclusive and effective learning environments. Through expert lectures, simulations, and practical exercises, learners develop the competencies to lead ethically sound and technologically adept educational practices.

2.5 Synthetic Patient Records – How and Why?

2.5.1 IVET curriculum summary

This course introduces IVET learners to the transformative role of AI in healthcare, with a special focus on synthetic data and its ethical, legal, and practical implications. Through real-world case studies and technical workshops, students explore how synthetic data is generated, used for research and development, and applied to preserve patient privacy. The course provides a structured overview of AI tools, regulatory frameworks (like the EU AI Act and MDR/IVDR), and methods for evaluating the quality and utility of artificial health data. Learners gain competencies in data management, prompt engineering, and critical analysis of ethical issues in medical AI use. By the end of the course, students can synthesize complex regulatory, technological, and ethical considerations in advising health organizations on AI adoption.

2.5.2 CVET curriculum summary

Aimed at professionals in the health sector, this CVET course explores how synthetic data supports innovation in AI-enhanced healthcare while ensuring privacy and regulatory compliance. Learners examine case studies on AI deployment in clinical settings, delve into synthetic data generation techniques, and explore how these data aid diagnostics, R&D, and patient safety. The curriculum covers ethical principles, the EU AI Act, and MDR/IVDR regulations, emphasizing practical application and multidisciplinary collaboration. Participants gain hands-on experience with open-source tools and develop policy and design recommendations through applied projects. The course empowers learners to navigate AI's legal, technical, and ethical landscapes and implement trustworthy solutions in their healthcare environments.

Co-funded by the European Union

2.6 Enhancing Doctor-Patient Interactions with AI

2.6.1 IVET curriculum summary

This course introduces IVET learners to the communication challenges between doctors and patients and how AI can support more effective, empathetic, and personalized interactions. Students explore barriers such as language differences, time constraints, and medical jargon, and learn how to apply AI tools like chatbots, translation software, and visual aids to address them. The curriculum includes practical scenarios and simulations to help learners practice empathy, build trust, and understand the ethical and regulatory responsibilities in healthcare. Special attention is given to patient education, cultural sensitivity, and fostering adherence through AI-powered reminders and guidance. By the end of the course, students are equipped to support improved patient outcomes through thoughtful and ethical integration of AI into medical communication.

2.6.2 CVET curriculum summary

Aimed at healthcare professionals and adult learners, this CVET course delves deeper into the complexities of doctor-patient interactions and how AI technologies can improve them. It covers advanced communication challenges, the ethical use of AI in clinical settings, and regulatory compliance such as GDPR and the AI Act. Learners explore how AI supports multilingual communication, medical adherence, and patient education through tools like NLP systems, generative visuals, and decision support systems. Real-world case studies and interactive learning methods foster critical thinking, cultural competence, and practical application of AI solutions. The course empowers professionals to responsibly integrate AI into healthcare practice, enhancing trust, personalization, and quality of care.

2.7 Using AI for Personalized Advertising Campaigns

2.7.1 IVET curriculum summary

The IVET version of this course offers foundational knowledge of AI in the context of advertising, combining social, cultural, economic, and technological perspectives. Learners are introduced to how AI transforms advertising strategies through modules that explore personalization, data use, and content generation. The course emphasizes critical and creative thinking, helping students understand cause-effect dynamics and ethical implications of AI in marketing. It develops both technical and soft skills, such as problem-solving, communication, and adaptability, while using practical tools and simulations. By the end of the course, learners are equipped to understand and contribute to AI-enhanced advertising in a variety of entry-level business and communication roles.

2.7.2 CVET curriculum summary

This CVET course is tailored for professionals seeking to upskill or reskill in AI-driven personalized advertising. It emphasizes real-world applications, showing how AI supports customer engagement across digital channels through tools like machine learning, predictive analytics, and generative AI. Learners gain hands-on experience in campaign design, content optimization, and ethical compliance, including GDPR and fairness in targeting. The course also covers advertising platforms such as Google, Meta, and Microsoft, offering practical insights into how AI

Co-funded by
the European Union

improves ROI and customer loyalty. With a blend of theory and practice, participants leave with actionable strategies for executing ethical, personalized campaigns using cutting-edge AI tools.

2.8 AI in Market Research

2.8.1 IVET curriculum summary

This course introduces IVET learners to the foundational and practical applications of artificial intelligence in the context of market research. It covers essential AI concepts like machine learning, NLP, and data mining, and explores how these technologies can enhance traditional research methodologies. Students engage with real-world tools and datasets to identify market trends, conduct sentiment analysis, and interpret unstructured data. Ethical concerns such as bias, data privacy, and compliance with regulations like GDPR are examined through case studies and critical reflection. The course emphasizes hands-on learning, teamwork, and adaptability, preparing learners to integrate AI into research processes and drive data-informed decision-making in marketing roles.

2.8.2 CVET curriculum summary

Designed for professionals in marketing and research roles, this CVET course focuses on equipping participants with advanced AI techniques for trend forecasting, sentiment analysis, and consumer insight generation. It combines foundational AI theory with industry-relevant tools and case studies to demonstrate how companies apply AI to optimize market strategies. Emphasis is placed on responsible AI usage, with modules on ethics, data protection, and overcoming implementation challenges. Participants learn to critically evaluate real-world applications, implement AI solutions in their workplace, and communicate findings effectively to diverse stakeholders. The course supports upskilling for dynamic environments by fostering adaptability, collaboration, and ethical awareness in AI-enhanced market research.

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

2.9.1 IVET curriculum summary

This course introduces IVET learners to the fundamental role of AI in transforming customer service, particularly within the retail sector. Students explore how chatbots, virtual assistants, and recommendation systems are designed and applied to improve customer interaction, operational efficiency, and personalization. Key AI techniques such as collaborative filtering, machine learning, and performance metrics are taught through practical examples and case studies. The curriculum also covers ethical considerations, customer data usage, and the future of AI in omnichannel retail experiences. Through a mix of theory and hands-on learning, learners develop both technical and soft skills to contribute to customer service innovation.

Co-funded by the European Union

2.9.2 CVET curriculum summary

Designed for professionals in retail and customer engagement, the CVET course focuses on real-world implementation of AI tools that enhance service personalization and efficiency. Participants work with advanced platforms such as TensorFlow, IBM Watson, and Adobe Sensei to create chatbots, manage dynamic pricing, and deliver data-driven recommendations. The course emphasizes customer-centric solutions, exploring AI's socio-economic impact, ethical use, and integration into both digital and in-store service channels. Learners gain experience with performance metrics, omnichannel strategies, and brand loyalty campaigns through project-based work and case studies. By the end, participants are prepared to design and apply AI-powered systems tailored to their customer service needs.

2.10 AI-Driven Inventory and Logistics Automation

2.10.1 IVET curriculum summary

This IVET course introduces learners to how artificial intelligence can be applied to automate and optimize inventory and logistics in the wholesale and retail trade sectors. It covers key topics such as AI fundamentals, forecasting inventory needs, building data pipelines, and implementing machine learning models. Through real-life case studies and simulations, learners explore how AI enhances stock accuracy, prevents shortages, and improves supply chain visibility. The course emphasizes both technical and soft skills, including teamwork, adaptability, and attention to detail when using AI tools. By the end, students are able to work with basic AI systems to support decision-making, identify fraud, and improve operational efficiency in retail and logistics environments.

2.10.2 CVET curriculum summary

The CVET course targets professionals seeking to advance their expertise in integrating AI into supply chain and inventory management. It provides in-depth training on machine learning, data infrastructure, predictive analytics, and cybersecurity, enabling participants to apply AI to forecast demand, automate stock management, and reduce operational costs. Real-world case studies and simulations help learners apply strategic thinking and decision-making using both proprietary and open-source AI tools. The curriculum also includes leadership and change management components to support organizational AI adoption. Learners graduate with the ability to lead AI integration projects, enhance logistics efficiency, and drive continuous innovation in inventory systems.

Co-funded by
the European Union

3. Conclusion

The AI4VET4AI project has set out to tackle one of the most pressing challenges facing vocational education and training today: preparing learners for a rapidly evolving, AI-driven labour market. Through the development of ten comprehensive curricula for both IVET and CVET learners, Deliverable D4.1 represents a major milestone in meeting this objective. The curricula are designed not only to convey technical competencies, but also to embed ethical reasoning, domain-specific problem-solving, and adaptability — all essential for future-proofing the workforce.

The process of curriculum development demonstrated the strength of collaboration among diverse partners from education, research, and industry. It was rooted in an inclusive methodology that prioritized both pedagogical integrity and real-world relevance. By focusing on five strategically chosen industries — Professional, Scientific and Technical Activities; Wholesale and Retail Trade; Human Health and Social Work; Education; and Accommodation and Food Services — the project ensured that the developed content resonates with current and future needs across various vocational profiles.

From the outset, the consortium agreed on the importance of introducing a universal foundation in AI across all curricula. This includes core concepts such as what AI is, common applications, and ethical considerations. Embedding these topics in the first unit of each course guarantees that all learners, regardless of background or career path, gain a shared understanding of AI's fundamentals. This strategy fosters interdisciplinary awareness and prepares learners to approach AI not merely as a tool, but as a transformative force whose impact must be critically understood and responsibly managed.

The structure and content of each curriculum were developed using a standardized template that captured:

- General, specific, and soft skills to be developed
- Intended learning outcomes per module/unit
- Recommended pedagogical approaches
- Assessment strategies
- Tools and resources
- Alignment with competency frameworks such as DigComp, LifeComp, and EntreComp

This approach ensured comparability across curricula while allowing for flexibility to reflect industry-specific contexts and national VET system requirements. Each curriculum also emphasizes applied learning through project-based tasks, simulations, and case studies, enabling learners to gain hands-on experience with real-world AI tools and scenarios.

A key feature of the development process was the thoughtful and strategic distribution of responsibilities across the consortium. Course leads were selected based on their experience in curriculum design and their familiarity with the respective industries. This decision helped ensure that content was pedagogically sound, contextually relevant, and implementable within VET systems. In parallel, feedback loops were built into the development timeline, enabling iterative improvement and peer review between partners.

Another strength of this deliverable is its dual-pathway design: for each topic, an IVET and CVET version were developed. This ensures alignment with the different learning needs, profiles, and educational settings of these two target groups. IVET curricula tend to provide more introductory, structured learning pathways, suitable for learners entering the labour market for the first time. CVET curricula, on the other hand, offer more advanced, modular, and application-driven content appropriate for upskilling and reskilling in dynamic professional environments.

Co-funded by
the European Union

As such, the curricula developed through D4.1 do more than transmit knowledge — they actively contribute to shaping an AI-aware and AI-capable workforce. The integration of ethical reflection, data protection (e.g. GDPR), and AI explainability helps prepare learners to critically assess the technologies they will use or be impacted by. This supports not only their personal career growth but also contributes to the broader societal goal of fostering trustworthy, human-centered AI in the European context.

It is also important to highlight that the work on these curricula is not static. As noted in the progress tracking process, the development has included regular screening, review, and incorporation of feedback. The IVET curricula were prioritized during early iterations, and their insights directly informed the evolution of the CVET versions. This cascading development strategy ensured consistency while allowing room for adaptation based on early results.

Looking ahead, these learner-oriented curricula form the pedagogical foundation for the teacher training curricula to be developed under T4.2. The structure, objectives, and methodologies piloted here will be mirrored and adapted to equip educators with the competencies needed to deliver the content effectively, confidently, and in accordance with evolving AI and educational standards.

In conclusion, this deliverable provides a robust, adaptable, and forward-looking set of resources that can be implemented and scaled within VET systems across Europe. It strengthens the bridge between technological innovation and vocational relevance, ensuring that learners are not only prepared to work with AI — but to work with it ethically, critically, and creatively. By investing in these curricula, the AI4VET4AI project has taken a significant step toward aligning vocational education with Europe's digital transformation goals, paving the way for a more inclusive and future-ready workforce

Co-funded by
the European Union

4. Annex – Curricula for IVET and CVET

4.1 Customer Relationship Management - using AI to provide better service to customers

4.1.1 CVET

COURSE SYLLABUS								
Course title:	Customer Relationship Management - using AI to provide better service to customers							
Study program and level		**Study field**			**Academic / school year**		**Semester**	
		/			2.,3.		4.,6.	
Course type				CVET				
University / school course code:								
Lectures	**Seminar**	**Tutorial**	**Work**	**Other work**	**Individual work**			**ECTS**
								3
Lecturer:								
	Language of the Lectures:			English/ national language				
	Language of the Tutorial:			English/ national language				

Co-funded by the European Union

Prerequisites:

No prerequisites are needed in order to attend the course

Content (Syllabus outline):

This is a course for CVET learners in accommodation and hospitality. Purpose of the course is to demonstrate how to use artificial intelligence (AI) for typical customer relationship management (CRM). Main pillars of the course are practice in using AI tools, teamwork related to introduction of new technology and recognizing potential of utilizing AI in hospitality. Students will learn the fundamentals of CRM along with the fundamentals of AI. The course will emphasize the role of data management for applications of AI. Throughout the course, students will practice using AI applications for solving typical CRM tasks. Through use cases and AI solutions of typical problem situations students will develop competences to efficiently implement AI tools for CRM in an ethical and secure way.

The course is consisting of the following units:

- **Unit 1: Principles of CRM**

Purpose of this unit is to present elements and challenges of CRM as tasks that require data management and opens possibility of automation. Reading in this unit covers key principles including customer-centric strategies, CRM processes and the importance of relationship building in business success. CRM strategies and technologies in this unit are presented from the aspect of data management and analysis of customer interactions.

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

This unit provides introduction to AI with examples and use case in hospitality. Activities in this unit should demonstrate that AI can enhance CRM by automating processes, providing insights through data analysis and offering personalized experiences. Reading will cover examples how AI in hospitality can optimize operations, improve guest experiences, and increase efficiency in accommodation and food services. This unit will explore real-world applications and benefits of AI-driven CRM solutions.

- **Unit 3: Ensuring Privacy and Security**

This unit addresses the importance of data protection laws like GDPR, strategies for securing customer data, and ethical considerations in using AI for CRM. Students will learn how to balance technological advancements with privacy concerns. Material in this unit will enable insight in customers synthetic microdata.

- **Unit 4: Data Management Techniques**

This unit covers various methods for data collection as well as data processing. These methods will be recognized as a part CRM data management process. The content in the unit will also emphasize the organization and storage of data for efficient retrieval and analysis. Exercises in this unit will teamwork oriented.

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

This unit specifically address potentials of predictive analysis. Students will explore customers datasets and practice feature selections, customer segmentation, making prediction and prescriptions for future actions. Focus of this unit will be on possibilities of AI to make explainable predictions and improve our practice.

Co-funded by the European Union

- **Unit 6: Customizing Customer Experiences**

This unit discusses how AI can be used to create unique experiences for customers, thereby increasing loyalty and engagement. Material in this unit will review data collecting methods related to customers experience, like surveys and social media monitoring. AI tools will be used for exploring possibilities to customize customer experiences.

- **Unit 7: Automated Customer Interaction**

Students in this unit will learn about benefits and costs of automated customer interaction. Through prepared use cases students will explore how to use AI tools for automated customer interaction. They will specifically discuss role of employees in automated customer experience. Students will analyse existing use cases in order to understand limitations of such approach.

- **Unit 8: Enhancing Customer Choices**

This unit covers how AI algorithms work to deliver tailored recommendations, enhancing user experience and increasing sales opportunities. Student will learn about examples of pattern recognition and automated recommendation systems related to customer choices. They will also learn how to optimize these engines in a CRM context.

- **Unit 9: Understanding Customer Sentiment**

This units deal with monitoring of messages from surveys, social media, and applications feedback. Students will practice extracting and analysing valuable insights from feedback to improve products and services. It emphasizes the importance of understanding customer reactions and emotions in CRM.

Competencies:

General competencies

- Problem-Solving – Applying AI solutions for CRM challenges
- Ethical Awareness - Understanding ethical implications of AI and data usage

Specific competencies

- Data management - Ability to manage data relevant for CRM
- Technical Proficiency - Skills in using AI tools for data management and customer service
- Strategic Planning - Ability to design CRM strategies using AI
- Customer-Centric Approach – Skills for developing customer relationships through personalized service

Soft competencies

- Problem-Solving Skills
- Communication and Interpersonal Skills
- Analytical Thinking
- Adaptability and Resilience

Co-funded by the European Union

Intended learning outcomes:

After completing this course, students will be able to:

- Explain core concepts and principles of CRM in the hospitality industry;
- Analyze business requirements and implement AI solutions for CRM improvement;
- Describe how AI technologies enhance customer relationship management;
- Understand data privacy regulations and security requirements in AI-driven CRM systems;
- Apply data privacy and security measures in CRM systems;
- Manage customer data using AI-powered tools and techniques;
- Implement customer segmentation strategies using AI algorithms;
- Evaluate and optimize AI-driven CRM solutions based on business performance metrics;
- Configure and manage AI chatbots and virtual assistants;
- Implement AI-powered recommendation systems;
- Apply sentiment analysis tools to derive actionable customer insights for CRM improvement;
- Develop AI-driven customer service strategies based on data-driven insights;
- Apply customer service strategies incorporating AI tools;

Learning and teaching methods:

- Interactive Lectures
- Practical work with CRM software and AI tools
- Team work

Readings:

Mandatory readings

.....

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

Co-funded by the European Union

Evaluation

Weight (in %)	Assessment:
25	Practical assignments
25	Case study analysis
25	Group project presentations
25	Written examinations

Co-funded by
the European Union

4.1.2 IVET

COURSE SYLLABUS			
Course title:	Customer Relationship Management - using AI to provide better service to customers		

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

Course type	IVET
University / school course code:	

Lectures	**Seminar**	**Tutorial**	**Work**	**Other work**	**Individual work**		**ECTS**
							5

Lecturer:	

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

Prerequisites:

Co-funded by the European Union

No prerequisites are needed in order to attend the course

Content (Syllabus outline):

This course is intended for IVET students in accommodation and hospitality. Its purpose is to demonstrate to students how to use artificial intelligence (AI) to improve customer relationship management (CRM). Students will learn the fundamentals of CRM along with the fundamentals of AI. The course specially emphasizes role of high-quality data for AI applications. Throughout the course, students will practice using AI applications for solving typical CRM tasks. They will also learn about the possibilities of advanced analytics of high-quality data like sentiment analysis. Through case studies and Project-Based Learning (PBL), students will develop competences to efficiently implement AI tools for CRM. Finally, they will learn how to implement these technologies in an ethical and secure manner.

The course is consisting of the following units:

- **Unit 1: Principles of CRM**

Purpose of this unit is to present elements and challenges of CRM as tasks that require data management and opens possibility of automation. Reading in this unit covers key principles including customer-centric strategies, CRM processes and the importance of relationship building in business success. CRM strategies and technologies in this unit are presented from the aspect of data management and analysis of customer interactions.

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

This unit provides introduction to AI with examples and use case in hospitality. Activities in this unit should demonstrate that AI can enhance CRM by automating processes, providing insights through data analysis and offering personalized experiences. Reading should cover examples how AI in hospitality can optimize operations, improve guest experiences, and increase efficiency in accommodation and food services. This unit should explore real-world applications and benefits of AI-driven CRM solutions.

- **Unit 3: Ensuring Privacy and Security**

This unit addresses the importance of data protection laws like GDPR, strategies for securing customer data, and ethical considerations in using AI for CRM. Students will learn how to balance technological advancements with privacy concerns. Material in this unit will enable insight in customers synthetic microdata.

- **Unit 4: Data Collection Techniques**

This unit covers various methods for data collection, including surveys, transactional data and social media analytics. These methods will be recognized as a part CRM data management process. The content in the unit also emphasizes the organization and storage of data for efficient retrieval and analysis.

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

This unit specifically address potentials of predictive modelling. Students will explore customers datasets and practice feature selections, customer segmentation, making prediction and prescriptions for future actions. Learning about linear regression will help students to realize that AI models can be simple and explainable.

- **Unit 6: Customizing Customer Experiences**

Co-funded by the European Union

This unit discusses how AI can be used to create unique experiences for customers, thereby increasing loyalty and engagement. Material in this unit will review data collecting methods related to customers experience, like surveys and social media monitoring. AI tools will be used for exploring possibilities to customize customer experiences.

- **Unit 7: Automated Customer Interaction**

Students in this unit will explore preconditions and potentials of AI tools for automated customer interaction. They discuss role of employees and automated services in improving customer experience. Students will analyse existing use cases and try to design new ones, to describe implementation and benefits of these tools.

- **Unit 8: Enhancing Customer Choices**

This unit covers how AI algorithms work to deliver tailored recommendations, enhancing user experience and increasing sales opportunities. Student will learn about examples of pattern recognition and automated recommendation systems related to customer choices. They will also learn how to optimize these engines in a CRM context.

- **Unit 9: Understanding Customer Sentiment**

This units deal with advanced data collection methods and data analysis, specifically collecting messages from surveys, social media, and applications feedback. Students will practice extracting and analysing valuable insights from feedback to improve products and services. It emphasizes the importance of understanding customer emotions in CRM.

Competencies:

General competencies

- Analytical Thinking - Ability to analyse data and derive actionable insights
- Ethical Awareness - Understanding ethical implications of AI and data usage
- Problem-Solving - Developing solutions for complex CRM challenges using AI

Specific competencies

- Technical Proficiency - Skills in using AI tools for data analysis and customer service
- Strategic Planning - Ability to design CRM strategies utilizing AI insights
- Customer-Centric Approach - Fostering customer relationships through personalized service

Soft competencies

- Communication and Interpersonal Skills
- Analytical Thinking
- Problem-Solving Skills
- Adaptability and Resilience

Co-funded by the European Union

Intended learning outcomes:

After completing this course, students will be able to:

- Explain core concepts and principles of CRM in the hospitality industry;
- Explain how AI technologies enhance customer relationship management;
- Apply data privacy regulations and security requirements in AI-driven CRM systems;
- Analyse customer data by utilizing AI-powered tools and techniques;
- Implement customer segmentation strategies using AI algorithms;
- Design personalization strategies based on AI-generated insights;
- Evaluate the effectiveness of AI-driven CRM solutions;
- Configure and manage AI chatbots and virtual assistants;
- Implement AI-powered recommendation systems;
- Conduct automated sentiment analysis and interpret results;
- Apply data privacy and security measures in CRM systems;
- Develop data-driven decision making skills based on AI-generated customer insights;
- Develop customer service strategies incorporating AI tools;
- Evaluate and select appropriate AI solutions for specific business needs.

Learning and teaching methods:

- Interactive Lectures
- Practical work with CRM software and AI tools
- Project-Based Learning

Readings:

Mandatory readings

.....

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

Co-funded by the European Union

Evaluation

Weight (in %)	Assessment:
25	Practical assignments
25	Case study analysis
25	Group project presentations
25	Written examinations

Co-funded by
the European Union

4.2 Using AI for Understanding Tourism Impact and Improving Sustainability

4.2.1 CVET

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

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

Course type	
University / school course code:	

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
						3

Lecturer:	

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

Co-funded by the European Union

Prerequisites:

No prerequisites are needed in order to attend the course

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. By the end of the course, learners will be able to understand how AI can be integrated into daily processes of public and private organizations in order to improve results, prevent overtourism, optimize customer journey and cross-cultural communication, and minimize sustainability footprint.

The following modules are especially emphasized:

Module A: Introduction to AI in Tourism

This module provides an outline of the definition and key ideas of AI in the context of tourism focusing on the application aspect. It will enable participants to understand how AI captures trends within tourism, evaluates the effects and promotes a successful implementation of sustainable initiatives at a lower cost. The emphasis is made on the practical aspects that a professional may find useful when implementing AI in the organization.

- ☐ **Unit A1: Understanding Tourism Trends** (Technological, Socio-Demographic, Sustainable Development)

AI is introduced with emphasis on its definition, simple concepts used in its implementation, potential uses, as well as application within the tourist industry. It covers trends influencing tourism including technology developments, changes in socio demography, sustainable development goals among others. Thereby, the potential of using AI applications to identify and address these trends is illustrated, and specific ethical issues such as data privacy, potential of AI to promote or reveal bias, and accountability are raised. They also discuss the role of AI in creating trust and offering support to the sustainable tourism practices.

- ☐ **Unit A2: Introduction to AI in Impact Assessment** (Economic, Social, Environmental)

The fundamentals of AI applications for assessing economic, social, and environmental effects of tourism are discussed. The focus is on how various AI methods aid in data gathering and analysis to the enhancement of decision making. Real-life scenarios are presented to show how AI can evaluate and mitigate tourism impacts for the realization of sustainable development goals.

- ☐ **Unit A3: AI-Supported Cost Optimisation in Tourism**

Basic concepts of cost reduction with the use of Artificial Intelligence for the tourism industry are identified, including pricing techniques, resource utilization, and energy management. These practical examples demonstrate that AI technology brings fundamental improvements to operational sustainability and profitability. Nevertheless, the concentration stays on offering the participants considerable understanding of how AI can support sustainable tourism without going into extensive details.

Module B: AI for Strategic Business Innovation in Tourism

Co-funded by the European Union

This module is designed to support managers in the tourism and hospitality industry in making smarter decisions and improve performance by using AI. It provides a clear, step-by-step guide for effectively using resources, forecasting demand, adapting to changing customer preferences, and boosting productivity. By the end of the module, participants will be equipped with useful examples and knowledge to assess and implement the right AI solutions in their organizations.

➔ Unit B1: Advanced Data Analytics for Professionals

In this unit, participants will expand their understanding of AI tools and techniques that can be used in their work. The focus will be on learning different data analysis methods, such as descriptive, diagnostic, predictive, and prescriptive analytics. Participants will learn how to turn these insights into practical steps to improve customer experience and service. Hands-on activities will show how these techniques can be applied in real work situations.

➔ Unit B2: Implementing Data-Driven AI Solutions for Industry Challenges

Participants will learn how AI-powered data solutions can solve key business challenges, such as improving efficiency and predicting demand based on past data. The focus will be on improving business processes, like managing seasonal changes, optimizing resources (such as staff, budget, and inventory), identifying trends, improving marketing strategies, and offering more personalized experiences.

➔ Unit B3: Leading Personalization and Ethical AI Adoption

Participants will explore latest personalization technologies and how they can be used to create tailored tourism experiences. They'll also see examples of how engaging technologies can lead to unique customer interactions. The unit will also cover important legal and ethical issues, such as privacy, algorithmic bias, and data security.

Module C: Sustainable Tourism Strategies with AI

In this module, the students will explore three dimensions of sustainability in relation to the tourism industry – social, environmental, and financial – and what role Artificial Intelligence plays or could play in it. They will learn how using AI one can measure, optimize, and monitor the impact of tourism on culture, community, and the environment. The overall goal of this module is to review the opportunities to make the tourism industry more sustainable using Artificial Intelligence.

➔ Unit C1: Sustainability in Tourism – AI for Community and Cultural Impact

This unit will analyze four specific case studies of how AI can improve the impact of tourism on culture and the local community. From analyzing public engagement to digitizing historic artifacts, from calculating the social value of funding directed at the tourist industry to predicting the time for maintenance of tourist sites – the unit will have practical examples of AI usage for Community and Cultural Impact.

➔ Unit C2: AI-Enhanced Environmental Sustainability in Tourism

One of the key challenges of tourist destinations is overtourism. From the point of view of the environment, it leads to various types of pollution, water scarcity, increased energy consumption, and in general overexploitation of the infrastructure and deterioration of nature. In this unit, we will look at several main applications of how Artificial Intelligence could elevate these issues. Using AI, it is possible to calculate the carrying capacity of tourist destinations, predict the long-term impact of current tourism patterns on the environment, and monitor the status of ecological sites.

➔ Unit C3: AI-Driven Resource Management Strategies for Sustainable Tourism

Co-funded by the European Union

One of the key benefits of utilizing AI tools in tourism could be improved energy, water, and waste management at the levels of both public authorities and small and medium enterprises (SMEs). The practical examples that will be covered in this unit include smart energy systems in tourism; water conservation applications; and waste reduction.

Competencies:

General competencies

- Become familiar with fundamental definitions of Artificial Intelligence (AI) theory as well as with its possible implementation in the sphere of tourism.
- Utilization of AI in recognizing and categorizing tourism trends of technology, socio-demography and sustainability.
- Understand the application of AI technology of analysis of tourism impacts on economic, social systems and environments.
- Test fundamental approaches to the utilization of AI to minimize business expenses but at the same time promote eco-tourism.
- Understand the ethical issues in the use of AI ranging from data protection and safety , bias, and accountability.
- The ability to comprehend and analyse diverse data sets.
- Understand how the AI and data analytics can support and provide personalised tourism experiences.

Specific competencies

- Analyse trends on tourism at advanced marketing levels and comprehend how applied artificial intelligence tools affect such trends.
- Understanding and appreciation of the foundational elements of AI methods that may be applied in capturing the effects of tourism on the three dimensions: economic, social and environmental.
- Ability to demonstrate a sensible approach toward the enhanced use of AI in cost-saving solutions in areas of resource management and price setting as well as improving energy efficiency.
- Education on how tourism can benefit through the use of AI in financing the sustainable development goals.
- Data Insights: Understanding the basics of data analysis and its importance.
- The ability of the AI derived data to be useful in enhancing operations in the tourism sector.
- Personalized Experiences: Applying AI to tailor tourism products and services to meet individual customer needs.
- AI in Marketing: Application of AI to create personalized marketing strategies and improve customer engagement.

Soft competencies

Co-funded by the European Union

- Curiosity for Emerging Trends: Interest in understanding key trends in tourism and how AI tools can address these changes effectively.
- Basic Ethical Awareness: Ethical concerns in the use of AI with an emphasis on applications to policy and implementation for data privacy and sustainability.
- Willingness to Learn: Flexibility to learn new things and adapt the different features of AI in view of the tourism sector.
- Problem-Solving: Develop innovative AI-driven strategies to address challenges in the tourism industry.
- Customer Focus: Improving customer satisfaction through personalized solutions.

Intended learning outcomes:

- Identify and apply AI technologies relevant to sustainable tourism operations.
- Utilize AI tools to assess and optimize tourism's economic, social, and environmental impact.
- Identify basic ways AI optimizes costs in tourism operations.
- Use AI tools to handle challenges like seasonal changes, managing resources, and predicting demand in tourism and hospitality.
- Analyze tourism data using AI to identify and leverage emerging trends and patterns.
- Recognize how AI-driven innovations can improve customer experiences in tourism.
- Develop AI-driven strategies to enhance sustainability and minimize tourism's environmental footprint.
- Review practical examples of how AI can improve the impact of tourism on culture and the local community
- Understand how AI can reduce the environmental footprint of tourism
- Apply AI tools in tourism to improve energy, water, and waste management....

Learning and teaching methods:

- Lectures
- Independent Study and Research
- Individual and Group Projects
- Hands-On Lab Work and Practical Exercises
- Problem-Based Learning (PBL) and Scenario-Based Analysis
- Case Studies and Real-World Applications

Readings:

Co-funded by the European Union

Mandatory readings Ali, K., and B. Keskin Burcu. AI In Operations Management Applications Challenges and Opportunities. Journal of Data Information and Management 2, 2020. 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 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. Fennell, D. A. (2019). Sustainable Tourism: Principles, Contexts and Practices. Mueller-Eberstein, M., Villafiorita, A., & Batina, L. (2020). AI for Good: A Practical Guide for Ethics, Innovation and Sustainable Development. Optional readings: Katja, Hutter, et al. How AI Revolutionizes Innovation management, Perceptions and Implementation Preferences of AIbased Innovators. Technological Forecasting and Social Change 178, 2022.

Evaluation

Weight (in %)	**Assessment:**

4.2.2 IVET

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

Co-funded by the European Union

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

Course type	

University / school course code:	

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
30 h		40 h			70 h	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 introduces the application of Artificial Intelligence (AI) in the tourism and hospitality industry, with a strong focus on sustainable development. It covers various AI technologies and how they operate within the socio-economic, environmental, and cultural aspects of tourism. By the end of the course, students will be able to understand how AI can be integrated into daily processes of public and private organizations operating in the

Co-funded by the European Union

tourism and hospitality industry to improve results, prevent overtourism, optimize customer journey and cross-cultural communication, and minimize sustainability footprint.

The following modules are particularly emphasised:

Module A: Introduction to AI in Tourism

This module will present an overview of how Artificial intelligence can be used in dealing with tourism for development purposes. Emerging tourism trends are reviewed with an emphasis on the use of AI in estimating tourism's impacts on the economy, society and environment. Another area of analysis within the module looks at how AI can be utilised to improve cost efficiency, as well as overall sustainability within the tourism industry. By the end of this unit, a basic knowledge shall be gained on how AI can be used to promote responsible tourism and how data gathered can be used to make decisions to meet sustainable goals.

➔ **Unit A1: Understanding Tourism Trends** (Technological, Socio-Demographic, Sustainable Development)

The basic concepts of Artificial Intelligence or its more common abbreviation AI will be defined and its particular use within the field of tourism introduced. A brief description of the subject of AI starting with the definition, the classification as narrow, and general AI as well as common uses of AI in various industries will be discussed in this section. After this, the unit examines important factors affecting tourism including technology, socio-demographic factors and sustainable development goals. Students through this unit will learn how AI tools can help track these trends and even provide feedback to organizations on how they may wish to adapt and shape these trends to the benefit of the consumer. Furthermore, the unit also explores some of the emerging ethical issues that are central to AI development such as data privacy, bias, and AI accountability with a view of underlining their contribution to trust and sustainability of AI based tourism practices. By the end of this unit, the students will be familiar with the various aspects of how the application of AI can assist and lead the change in the tourism industry to embrace socially appropriate and sustainable practices.

➔ **Unit A2: Introduction to AI in Impact Assessment** (Economic, Social, Environmental)

Students will familiarize themselves with the basics of employing AI in evaluating the economic, social, and environmental effects of tourism. The emphasis will be made on the potential of using AI techniques in data gathering and evaluation and how these assessments might be used to make reasonable decisions on employee relations. Real world examples will be employed at the preliminary level without going through complex case studies.

➔ **Unit A3: AI-Supported Cost Optimisation in Tourism**

The basic aspects of cost optimisation enabled through the use of AI in tourism operations with the aim of enhancing sustainability goals will be discussed in this section. Some basic examples of AI's application in the area of cost distribution, determination of the prices, and energy management will be introduced to students. The focus will be on explaining how the use of AI is capable of contributing to the sustainable and profitable organization's management without going deeper into the problem of thorough resource utilization.

Module B: AI for Enhancing Business Decision-Making

The module focuses on the use of AI to improve decision-making processes in the tourism and hospitality industry. By using AI solutions, tourism providers can optimize resource utilization, forecast demand, adapt to customers,

Co-funded by the European Union

and improve operational efficiency. The module gives students the knowledge and skills to apply AI to real-world business challenges, and helps them understand how technology and quality data can support business processes and strategic decisions.

➔ Unit B1: Approaches to Data Analysis

Students will examine fundamental AI tools, frameworks and approaches to data processing, data analysis, including descriptive, diagnostic, predictive and prescriptive methods, that can be used for improving customer engagement or optimizing tourism services by discovering patterns, understanding causes and predicting trends to support decision making.

➔ Unit B2: Data-Driven AI Solutions (Seasonality Management, Tourist Flow Management)

Students will look into the practical application of AI-driven data solutions to address key business challenges: improving operational efficiency, forecasting demand based on past historical data. The focus is on possibilities to improve business processes: managing seasonality, optimising business processes and resources (human resources, financial resources, inventory), and the recognition of trends, marketing optimisation, and personalisation. Practical examples of AI supported solutions in real-world scenarios will be presented.

➔ Unit B3: AI-Based Personalisation of Tourism Experiences

Students will learn about personalization trends and explore tools that support customized travel services or personalised recommendations to improve customer satisfaction and loyalty. The unit will also highlight the use of immersive technologies to create unique customer interactions. Students will investigate the legal and technical implications of personalization, including privacy, security, and algorithmic bias concerns.

Module C: Sustainable Tourism Strategies with AI

In this module, the students will explore three dimensions of sustainability in relation to the tourism industry – social, environmental, and financial – and what role Artificial Intelligence plays or could play in it. They will learn how using AI one can measure, optimize, and monitor the impact of tourism on culture, community, and the environment. Additionally, the module will cover the possibilities of utilizing AI tools in resource management. The overall goal of this module is to review the opportunities to make the tourism industry more sustainable using Artificial Intelligence.

➔ Unit C1: Sustainability in Tourism – AI for Community and Cultural Impact

This unit will analyze four specific case studies of how AI can improve the impact of tourism on culture and the local community. From analyzing public engagement to digitizing historic artifacts, from calculating the social value of funding directed at the tourist industry to predicting the time for maintenance of tourist sites, from managing the crowds to aiding cross-cultural communication – the unit will have practical examples of AI usage for Community and Cultural Impact.

➔ Unit C2: AI-Enhanced Environmental Sustainability in Tourism

One of the key challenges of tourist destinations is overtourism. From the point of view of the environment, it leads to various types of pollution, water scarcity, increased energy consumption, and in general overexploitation of the infrastructure and deterioration of nature. In this unit, we will look at several main applications of how Artificial Intelligence could elevate these issues. Using AI, it is possible to calculate the carrying capacity of tourist destinations, predict the long-term impact of current tourism patterns on the environment, and monitor the status

Co-funded by the European Union

of ecological sites. That would allow to inform policy making and regulations that can reduce the environmental footprint while preserving healthy tourist inflows.

→ Unit C3: AI-Driven Resource Management Strategies for Sustainable Tourism

One of the key benefits of utilizing AI tools in tourism could be improved energy, water, and waste management at the levels of both public authorities and small and medium enterprises (SMEs). The practical examples that will be covered in this unit include: 1) smart energy systems applied in tourism that can adjust energy consumption in real-time; 2) water conservation applications that minimize the pressure on the water resources and limit waste of water; 3) and waste reduction. The case studies explored in this unit have been implemented by tourist actors in both the public and private sectors.

Competencies:

General competencies

- Analytical Thinking: Proper analysis of tourism data with unique capability to differentiate essential patterns and trends.
- Strategic Mindset: Knowledge of the existing trends for choosing the development directions of tourism technologies, changes in the socio-demographic characteristics of population and the requirements for the development of sustainable tourism. This is focused on appreciation of factors that determine patterns in the industry.
- Cost Optimization: Understanding of costs within the operations of tourism enterprises and how AI can assist with sustainable cost management. This encompasses a concept of resource utilisation decision making that factors in both productivity as well as sustainability.
- Detecting ethical AI: Realizing specific aspects in the context of responsible AI application for and in tourism, including data handling, data protection, and relevance of giving fair assessment in multicultural settings.
- Understanding AI Technologies: Students will gain a foundational understanding of AI technologies and their applications in the tourism and hospitality industry.
- Data Literacy: Ability to understand and interpret various data sets.
- Sustainability: Knowledge of how AI and data analytics can support and provide personalised tourism experiences.
- Human-centered AI: Recognition that AI is human-led and integral comprehension of human agency which may cover principles on data ownership and data privacy, protection of human rights, explainability of AI methods, human control in deployment, and human determination in using AI for decision-making.

Specific competencies

- Trend Analysis: Competency in analyzing technological, socio-demographic and sustainability trends as seen from data analysis of the various trends affecting tourism.
- Impact Assessment Skills: Information about AI techniques for measuring the economic, societal and environmental effects of tourism.

Co-funded by the European Union

- Cost Optimization Strategies: Gaining insights into the AI in management of resources, setting of optimal prices for products and services and managing environmental impacts in the provision of tourism services.
- Ethical AI Application: Capacity to utilize AI tools responsibly so as to guarantee that assessments of tourism practices are not biased.
- AI-based Decision-Making: Competence in using AI to support informed business decisions.
- Data Insights: Understanding the basics of data analysis and its importance.
- Personalized Experiences: Applying AI to tailor tourism products and services to meet individual customer needs.
- Efficient Operations: Optimization of staffing, inventory, and resources using AI-driven solutions.
- AI in Marketing: Application of AI to create personalized marketing strategies and improve customer engagement.
- Using AI one can measure, optimize, and monitor the impact of tourism on culture, community, and the environment in the context of sustainable development

Soft competences

- Proactivity: This perspective has been proactive in efforts to examine the phenomenon and changes within the tourism domain and how AI can be utilized to address existing trends.
- Continuous Learning: A flexible strategy toward developing AI technologies and concerning new trends in sustainability in tourism.
- Problem-Solving: Develop innovative AI-driven strategies to address challenges in the tourism industry.
- Critical Thinking: Strengthen the ability to analyze data and evaluate AI technologies' impact in diverse scenarios.
- Ethical Awareness: Understand the ethical implications of AI, particularly in areas like data privacy, sustainability, and social responsibility.
- Customer Focus: Improving customer satisfaction through personalized solutions.

Intended learning outcomes:

- Analyze technological, socio-demographic, and sustainability trends in tourism using AI tools.
- Assess the Impact of Tourism with AI: Use of AI techniques to analyse the economic, social and environmental factors of tourism.
- Optimize Costs with AI for Sustainability: Create cost savings strategic models leveraging AI that also think of the environment as well as the society.

Co-funded by the European Union

- Promote Responsible AI Use in Tourism: Examine the main problem areas of AI implementation and use the data privacy, fairness, and sustainability of the tourism industry.
- Utilize advanced tools powered by artificial intelligence to tackle operational challenges like seasonality, resource allocation, and predicting demand within the tourism and hospitality sectors.
- Gain insights into how AI can uncover trends and patterns from complex data sets.
- Assess the effects of AI-driven innovations on business performance and customer satisfaction, particularly in the context of the tourism industry.
- Demonstrate how using AI one can measure, optimize, and monitor the impact of tourism
- Identify and assess AI-driven strategies for sustainable tourism development.
- Review practical examples of how AI can improve the impact of tourism on culture and the local community
- Analyse AI impact on the environmental tourism footprint
- Apply AI tools in tourism could be improved energy, water, and waste management

Learning and teaching methods:

- Lectures
- Independent Study and Research
- Individual and Group Projects
- Hands-On Lab Work and Practical Exercises
- Problem-Based Learning (PBL) and Scenario-Based Analysis
- Case Studies and Real-World Applications

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

Co-funded by the European Union

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:**

Co-funded by the European Union

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

4.3.1 CVET

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**
CVET	/	2.,3.	4.,6.

Course type	

University / school course code:	

Lectures	**Seminar**	**Tutorial**	**Work**	**Other work**	**Individual work**		**ECTS**
16		20			48		3

Lecturer:	

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

Prerequisites:

Co-funded by the European Union

No prerequisites are needed in order to attend the course

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.

The following modules are especially emphasised:

Module A: Foundations of AI for Personalized Learning and Growth

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

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

Learners will gain foundational knowledge of AI concepts and personalization in education, including key algorithms and applications tailored for academic growth. Students will learn about practical methods and examples of how AI can be utilised to foster personalised learning in classrooms, making it ideal for students interested in applied AI methods.

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

Learners will explore how AI tools can track learning patterns, set life-learning goals, and support self-improvement; apply data literacy for strategic adjustments. Course will highlight practical ways generative AI, like large language models, can support customised learning by identifying gaps and recommending tailored resources, promoting self-driven improvement.

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

Learners will examine ethical considerations, privacy rights, and responsibilities in using AI tools; engage in case studies and discuss current regulations affecting learners. Course will address machine learning in education with a strong emphasis on ethical standards, focusing on data privacy and fostering trust in AI applications for educators and learners alike.

Module B: Optimising Study Efficiency and Academic Performance with AI

This module introduces students to interpreting and implementing AI-driven feedback to refine academic skills and boost learning outcomes. It also covers AI tools that help students organise schedules, meet academic deadlines, and manage workloads. By understanding AI recommendations, students will tailor study strategies to their unique needs and strengths. Through advanced applications of AI planners, students will develop techniques for balancing multiple academic

Co-funded by the European Union

responsibilities effectively. Additionally, the module equips students to use AI tools to enhance teamwork in academic projects.

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

Through the unit, learners 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, learners will be able to apply AI-driven planners to optimise personal schedules and maximise productivity. The unit will further allow learners to analyse the impact of AI-assisted time management on academic performance and personal well-being.

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

The unit aims to develop learners' understanding of how AI tools can streamline group work by assisting with task delegation and role assignments. With this knowledge, learners are able to implement AI solutions to monitor and enhance team contributions, ensuring a balanced participation, further enabling them to evaluate the impact of AI on their group dynamics using feedback from team members.

Module C - Innovating Learning Techniques with AI

The module covers the application of artificial intelligence to creative thinking and collaborative learning. Through the module, we apply AI to encourage innovation, creativity and the adoption of educational outcomes.

- Unit C1 - **Enhancing Problem-Solving and Research Skills with AI**
  Participants will develop research skills with the help of AI tools. Participants will first collect data using AI, then process the information and then use different methods of data analysis, 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 will explore AI-Driven Gamification. The main emphasis is on using AI simulations and quizzes to perfect important gamification concepts. Participants will be shown through examples how to adjust the difficulty of the content according to the performance of the participants. Participants will explore ways in which AI can monitor personal progress, recognize difficulties and provide feedback.

Co-funded by the European Union

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

Participants will through examples explore the applications of AI used in various industries and education. They will research and analyze the labor market to understand how AI is changing the labor market. Through assignments and discussions, participants will develop the 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 to make adjustments in their learning paths, enhancing engagement and progress tracking.
- General Competency 3 - foundational understanding of ethical principles related to AI, including privacy, data security, and fairness.
- General Competency 4 - Understand and implement AI-driven feedback to improve individual and group academic performance.
- General Competency 5 - Use AI-based tools strategically for time management, collaborative learning, and study efficiency.
- 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.

Specific competencies

- Specific Competency 1 - Knowledge of key AI algorithms used in personalization.
- Specific Competency 2 - apply key algorithms, such as recommendation systems and natural language processing, to customise learning experiences
- Specific Competency 3 - apply ethical principles to real-world scenarios, ensuring responsible use of AI tools.
- Specific Competency 4 - Apply personalised AI feedback to refine learning habits and optimise study techniques.
- Specific Competency 5 - Manage academic tasks efficiently by leveraging AI tools for planning and prioritisation.

Co-funded by the European Union

- 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 use the 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 apply AI-based tools for adaptive learning, performance tracking, and self-guided improvement.
- Learning Outcome 2 Learners apply AI-powered data analytics to monitor learning progress, personalize instructional strategies, and enhance learner engagement.
- Learning Outcome 3 - Learners implement AI-powered education solutions while ensuring compliance with data protection laws and ethical AI principles.

Co-funded by the European Union

- Learning Outcome 4 - Learners are able to analyse and apply AI-generated feedback to develop study strategies that address personal academic challenges.
- Learning Outcome 5 - Utilise 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, 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.
- **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.
- Learning & Teaching methods 4: Case discussions for analysis of real-world examples to connect theoretical concepts with practical use cases for AI in education.
- 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 practise using AI tools in a collaborative environment to simulate effective team project management.
- Learning & Teaching methods
    - Method of lectures and demonstrations (what is AI? Examples of use in everyday life)
    - Research method (Application of AI applications in design, music, writing and painting)
    - Work in groups (find a creative solution to the challenge - design a logo, write a short story, create a short marketing slogan)
    - Discussion method (Discussion on ethical issues: the role of AI in the jobs of the future, how to balance automation and human creativity, copyright)

Co-funded by the European Union

- Lecture and demonstration method (Explain the concept of gamification, give an example of gamified platforms that use AI)
- Project method (Create your own gamification task - design a task on an educational topic, pay attention to scoring, levels)
- Demonstration method (present the project task with a detailed description of the elements and AI tools that were used)
- Discussion method (Discussion about how gamification can help us in learning)

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.

Optional readings:

- Yu, H. (2023). *AI-Powered Personalized Learning: Toward Sustainable Education.* New York: Springer.
- Holmes, W., & Co-editors. (2022). *The Cambridge Handbook of Artificial Intelligence in Education.* Cambridge, UK: Cambridge University Press
- Holmes, W., & Porayska-Pomsta, K. (Eds.). (2022). *The Ethics of Artificial Intelligence in Education: Practices, Challenges, and Debates.* New York, NY: Routledge

Evaluation

Weight (in %)	**Assessment:**

Co-funded by the European Union

xx **yy** **zz**	**Assessment type 1** A culminating **mini project** allows students to demonstrate their grasp of AI in personalised learning by proposing an AI-driven educational solution or framework. They could explore ethical aspects, data privacy, and/or AI application limitations. **Presentations** of their projects will help them synthesise learning and communicate complex ideas, preparing them for real-world professional environments. **Analysis of tasks created by students using AI tools** **A short quiz** **Analysis of completed projects** **Discussion**

4.3.2 IVET

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
IVET	/	2.,3.	4.,6.

Course type	
University / school course code:	

Co-funded by the European Union

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
30		40			70	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 students and early-career learners with a robust foundation in AI principles while fostering essential skills in personalised learning and self-management. Tailored to those beginning their professional journeys, the course covers AI fundamentals, ethics, and personalization in a way that builds confidence in understanding and using AI tools for individual growth and learning success. 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 learners for an AI-powered workplace. By engaging with interactive, gamified tools and real-world examples, learners gain 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 students to foundational and applied aspects of AI in education, focusing on its role in personalising learning experiences. The course explores AI fundamentals, customization of learning paths, and ethical considerations, aiming to develop students' ability to leverage AI for academic success responsibly. Students will engage with hands-on activities, case studies, and data-driven insights to apply AI concepts to personalised learning approaches.

Co-funded by the European Union

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

Students will be given a comprehensive understanding of the fundamental concepts of artificial intelligence, including key algorithms and applications tailored for academic growth. They will explore how AI can be used to automate tasks, improve performance, analyse large data sets to predict trends and tailor learning experiences to individual needs. The course will focus on practical methods and examples of how AI can be used to promote personalised learning in classrooms, making it ideal for students interested in applied AI methods.

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

Students will explore how AI tools can track learning patterns, set academic goals, and support self-improvement; apply data literacy for strategic adjustments. Unit will highlight practical ways generative AI, like large language models, can support customised learning by identifying gaps and recommending tailored resources, promoting self-driven academic improvement.

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

Students will examine ethical considerations, privacy rights, and responsibilities in using AI tools; engage in case studies and discuss current regulations affecting students including the EU AI Act. Unit will address education with a strong emphasis on ethical standards, focusing on data privacy, the implications of predictive modelling, and fostering trust in AI applications for educators and learners alike.

Module B: Optimising Study Efficiency and Academic Performance with AI

The module aims to familiarise learners with introductory concepts related to- and main uses of AI to help them obtain and work with actionable feedback, to assist them with time management, and to introduce them to collaborative AI tools. Through the module, learners will be able to experience hand-on exercises and participate in interactive AI tool demos which they will, at a later stage, attempt to apply to their specific needs.

- **Unit 1: AI-Enhanced Feedback and Study Strategies**

Students learn how to interpret AI-generated feedback on assignments and academic tasks, applying it to refine their study strategies. In this unit, learners will explore how AI can simplify academic tasks, enhance learning engagement, and support their overall academic goals. They will learn about how AI works to customise learning experiences based on user data, how to appropriately tweak their prompts and ensure data quality to promote best practice among learners. Upon successful completion, learners can apply introductory AI tools to identify personal academic strengths and areas for improvement.

- **Unit 2: Managing Time and Tasks with AI Assistance**

Participants will delve into AI-powered tools that support self-directed study such as time management streamlining, task organisation, and workload prioritisation. This unit will introduce learners to the use of AI supplementary tools in existing study management applications to further allow them to automate tasks, monitor progress, generate more digestible formats of their notes and study materials based on their preferred learning

Co-funded by the European Union

style, and generate practice materials to help them prepare for assessments. By learning to work with AI-powered tools for study, students will be able to reallocate time and prioritise academic growth via deeper interaction with learning materials.

- **Unit 3: Collaborative Learning and Team Dynamics through AI**

This unit will demonstrate AI's capacity to enhance group work by assigning roles, tracking contributions, and encouraging balanced participation. Upon successful completion, learners will enhance their collaborative and problem-solving skills, using AI as a facilitator to foster effective teamwork and academic cooperation. The aim is for learners to understand the functions of AI in enhancing team dynamics, identifying the support AI integration offers. The unit will allow students to evaluate the impact of AI-assisted collaboration on group outcomes and refine their methods of collaboration going forward.

Module C: Innovating Learning Techniques with AI

The module focuses on the application of artificial intelligence to creative thinking and collaborative learning. Through the module, AI is applied to encourage innovation, creativity and the adoption of educational outcomes.

- **Unit 1: Enhancing Problem-Solving and Research Skills with AI**
  Develop analytical skills with AI tools for research, data synthesis, and creative problem-solving in academic settings.

Participants will research with the help of AI tools. Participants will first collect data using AI, then process the information and then use different problem solving methods. Participants will search, process and analyze data with the help of AI, and will create a research report with the help of AI.

- **Unit 2: Interactive Learning through AI-Driven Gamification**
  Engage with AI-driven simulations and quizzes that reinforce learning; explore gamified tools to boost engagement and concept mastery.

Participants will explore AI-Driven Gamification. In this way, learning should be more interesting and useful to the participants. The main emphasis is on using AI simulations and quizzes to refine important concepts. Participants will be shown through examples how to adjust the difficulty of the content according to the performance of the participants. Ways in which AI can monitor personal progress will be explored, difficulties will be recognized and feedback provided.

- **Unit 3: 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.

Participants will through examples explore AI applications used in educational institutions, such as personalized learning, automated assessment and student support. They will research and analyze the labor market to understand how AI is changing traditional occupations and creating new jobs. Through assignments and discussions, participants will develop the skills needed for careers that use AI, such as improving business processes, solving challenges, and managing data.

Co-funded by the European Union

Competencies:

General competencies

- General Competency 1 - clear 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, analyse, and apply data to make strategic adjustments in their learning paths, enhancing engagement and progress tracking.
- General Competency 3 - foundational understanding of ethical principles related to AI, including privacy, data security, and fairness.
- General Competency 4: Recognize AI's potential to transform academic routines and support self-directed learning to enhance student outcomes.
- General Competency 5: Understand and leverage AI to personalise and optimise academic learning.
- General Competency 6: Apply AI-based tools to manage time, collaborate effectively, and enhance problem-solving skills.
- General Competency 7: To introduce students to the basic concept and capabilities of artificial intelligence (AI) in creative problem solving.
- General Competency 8: Develop critical thinking about the advantages and disadvantages of using AI in different areas of life.
- General Competency 9: Enable students to use AI tools for practical purposes.
- General Competency 10: Develop the ability to recognize ethical issues related to the use of AI.
- General Competency 12: Develop an understanding of the benefits of applying gamification and AI in education, as well as their key tools.
- General Competency 13: Enable students to create a simple gamified educational task with the help of AI tools.

Specific competencies

- Specific Competency 1 - used in personalization, such as recommendation algorithms, natural language processing (NLP) for student feedback, and data clustering for learning pattern recognition.
- Specific Competency 2 - Applications algorithms, such as recommendation systems and natural language processing, to customise learning experiences.
- Specific Competency 3 - apply ethical principles to real-world scenarios, ensuring responsible use of AI tools in education.
- Specific Competency 4: Utilise AI-driven insights for self-directed study planning and goal-setting.
- Specific Competency 5: Manage academic tasks with AI to meet deadlines and balance workloads.
- Specific Competency 6: Collaborate in team environments with the support of AI for role management and contribution tracking.

Co-funded by the European Union

- Specific Competency 7 -Students will acquire skills in using AI tools to generate educational materials (e.g. questions for quizzes, assignments)
- Specific Competency 8 - Students will be able to design a basic gamified educational task using AI tools
- Specific Competency 9 - Student will develop a critical awareness of the benefits and potential challenges of introducing gamification and AI in education
- Specific Competency 10 -- Students will expand their digital literacy through hands-on experience with AI tools and gamification platforms

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 in education.
- Soft Competency 3 -Make informed decisions using AI in learning based on ethical considerations.
- Soft Competency 4: Adaptability and ethical reasoning in responsible use of AI in personal and group settings.
- Soft Competency 5: Teamwork and communication skills, facilitated by AI tools for project collaboration.
- Soft Competency 6: Critical thinking and self-reflection based on AI feedback for continuous improvement.
- 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, increasing student motivation.
- Soft Competency 9: Develop the ability to adapt and be open to technological advances.

Intended learning outcomes:

- Learning Outcome 1 -Students will demonstrate the ability to interpret, analyse, and apply educational data responsibly to inform learning paths, engagement, and progress tracking.
- Learning Outcome 2 -Students leverage AI tools effectively for personalised learning and self-improvement.
- Learning Outcome 3 -Students will apply relevant AI regulations, such as data privacy and ethical standards to ensure responsible and compliant AI practices in education.
- Learning Outcome 4: Analyse AI tools and feedback to develop personalised study strategies and effectively manage academic tasks.

Co-funded by the European Union

- Learning Outcome 5: Use AI applications for effective time management and collaborative learning, allowing for structured task delegation and contribution mapping in a group setting.
- Learning Outcome 6: Use AI-assisted tools to develop problem-solving techniques, enhance interaction with learning materials, and foster a proactive learning mindset.
- Learning Outcome 7:Analyze the fundamentals of artificial intelligence and demonstrate its role in solving real-world problems.
- Learning Outcome 8: Participants will independently design and present a simple gamified task.
- Learning Outcome 9: Develop AI-driven solutions to defined problems, demonstrating the application of appropriate tools and methodologies.

Learning and teaching methods:

- Learning & Teaching methods 1 -**Lectures and demonstrations** will provide core theoretical content, presenting essential AI concepts, personalization principles, 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 students to work with AI tools and algorithms for personalised learning. Students could experiment with algorithms to customise learning experiences or simulate tracking and adapting learning paths based on AI data. **Generative AI exercises** could involve tools like ChatGPT or similar language models where students 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 student data.
- **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.
- Conceptual overviews (**glossaries and documentation**) covering foundational AI principles, basic terminologies, privacy/ethics, inclusive of case studies or examples to promote personalised learning.
- **Self-reflection activities** using exercises to assess AI-driven feedback and personal study techniques.
- Method of lectures and demonstrations (what is AI? Examples of use in everyday life).
- Research method (Application of AI applications in design, music, writing and painting).
- Work in groups (find a creative solution to the challenge - design a logo, write a short story, create a short marketing slogan).
- Discussion method (Discussion on ethical issues: the role of AI in the jobs of the future, how to balance automation and human creativity, copyright).
- Lecture and demonstration method (Explain the concept of gamification, give an example of gamified platforms that use AI).
- Project method (Create your own gamification task - design a task on an educational topic, pay attention to scoring, levels).

Co-funded by
the European Union

- Demonstration method (present the project task with a detailed description of the elements and AI tools that were used).
- Discussion method (Discussion about how gamification can help us in learning).
- Cooperation with experts (engineers and experts in artificial intelligence through lectures or workshops on the application of new technologies).

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.
- Amal, S., Saiid, I., & Mansor, H. (2024) "An Empirical Study for the Dynamic and Personalised Learning Experience of the AI Course Generator", *International Journal on Perceptive and Cognitive Computing*, 10 (2), pp. 23-30. DOI: 10.31436/ijpcc.v10i2.483.
- 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.
- Mulaudzi, L. & Hamilton, J. (2024) "Student Perspectives on Optimising AI Tools to Enhance Personalised Learning in Higher Education", *Interdisciplinary Journal of Education Research*, 6 (51): pp. 1-15. DOI: 10.38140/ijer-2024.vol6.s1.03.
- Singh, S. & Hiran, K. (2022) "The Impact of AI on Teaching and Learning in Higher Education Technology", *Journal of Higher Education Theory and Practice*, 22 (13): DOI: 10.33423/jhetp.v22i13.5514.
- 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.

Optional readings:

- Yu, H. (2023). *AI-Powered Personalized Learning: Toward Sustainable Education.* New York: Springer.
- Holmes, W., & Co-editors. (2022). *The Cambridge Handbook of Artificial Intelligence in Education.* Cambridge, UK: Cambridge University Press

Co-funded by the European Union

- Holmes, W., & Porayska-Pomsta, K. (Eds.). (2022). *The Ethics of Artificial Intelligence in Education: Practices, Challenges, and Debates*. New York, NY: Routledge.

Evaluation

Weight (in %)	**Assessment:**
xx **yy** **zz**	**Assessment type 1** A culminating **mini project** allows students to demonstrate their grasp of AI in personalised learning by proposing an AI-driven educational solution or framework. They could explore ethical aspects, data privacy, and/or AI application limitations. **Assessment type 2** **Presentations** of their projects will help them synthesise learning and communicate complex ideas, preparing them for real-world professional environments. **Assessment type 3** • Analysis of tasks created by students using AI tools • Short quiz • Analysis of completed projects • Discussion

Co-funded by the European Union

4.4 Human-AI Collaboration in Teaching and Learning

4.4.1 CVET

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

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

Course type	
University / school course code:	

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
X					X	3

Lecturer:	TBD

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

Co-funded by the European Union

Prerequisites:

No prerequisites are needed in order to attend the course

Content (Syllabus outline):

This course

Module 1: Introduction to AI in Education & AI-Assisted Learning and Teaching Tools

This module provides an overview of the growing field of Artificial Intelligence (AI) in education. Students will learn about AI's potential and explore practical applications of AI-powered tools for enhancing learning and teaching experiences. The module is sub-divided into the following three units:

Unit 1.1: AI and its Role in Education

This unit will introduce students to AI core concepts, definitions (e.g. narrow AI vs. general AI) and functionalities (e.g., AI learning, AI reasoning, AI problem solving) as well as discuss historical AI developments and current trends. Furthermore, it will provide an overview of the most common applications for AI technology in teaching and learning settings (i.e., automatization, data analytics and personalization).

Unit 1.2: AI in Student Assessment and Feedback

This unit will introduce students to different AI tools they can use to analyze learning progress and consequently identify learning gaps. Also, the unit will cover automatic feedback tools and how they may effectively be used in Human-AI collaborative learning settings.

Unit 1.3: AI-based Tutoring Systems, Chatbots and Virtual Assistants in Education

This unit will particularly focus on AI-based conversational tutoring systems. Students will be able to experience different types of educational chatbots and virtual assistants so as to better understand both their influence on learners' learning experiences as well as their potential challenges and technical limitations.

Module 2: AI for Personalized Learning and Adaptive Systems

This module explores the potential of AI in creating personalized learning experiences and adaptive educational systems. Students will learn about the theory and practice of AI-driven tools that address individual student needs, optimize learning pathways, and provide valuable insights for educators. The module is sub-divided into the following three units:

Unit 2.1: Adaptive Learning Technologies

This unit introduces students to the foundations of AI-supported adaptive learning, thereby covering rule-based as well as machine-learning based approaches. Furthermore, it will explore ways to tailor content, pace and learning activities to learners' personal needs and preferences. To this end, it will also discuss AI-tools that help identify additional resources and learning materials adjusted to individuals' learning progress.

Unit 2.2: AI-Powered Learning Management Systems (LMS)

This unit will cover AI-powered Learning Management Systems and how they should be designed and implemented so that they not only provide students with relevant learning material but rather offer personalized

Co-funded by the European Union

guidance, feedback and support. The unit concludes with a case study of the successful implementation of an adaptive learning platform.

Unit 2.3: Data-Driven Insights in Learning

The last unit of this module focuses on generation of data-driven insight. It will discuss different tools and methods for collecting, analyzing and interpreting student data and thereby help to understand distinct learning patterns. This will provide the necessary foundation to identify students who are at-risk of failing and thus require proactive interventions. Finally, the unit will also cover visualization techniques that can be used to communicate insights to educators and other stakeholders.

Module 3: Ethical and Pedagogical Considerations

This module focuses on ethical and pedagogical challenges connected to AI-supported education. Students will thereby examine the benefits and challenges of integrating AI tools into educational settings. The focus shall be on supporting effective human-AI collaboration while upholding ethical principles and ensuring data security. The module is sub-divided into the following three units:

Unit 3.1: Integration of AI in teaching settings

This unit will introduce students to different teaching strategies which effectively leverage AI so as to promote student engagement. In doing so, it will provide future educators with the knowledge and skills to use AI tools both confidently and responsibly and thus help create inclusive human-AI collaborative learning spaces.

Unit 3.2: Human-AI Collaboration in the Classroom

Based on the first unit of this module, the second unit will discuss the different, often complementary roles of teachers and AI in learning settings. It will also cover the challenges of peer learning in AI-enhanced learning environments and thus shall trigger critical reflections concerning the pros and cons of using AI in the classroom.

Unit 3.3: Ethics in AI for Education & Privacy and Data Security in AI-Based Learning Systems

Finally, the last unit of this module will examine ethical principles (i.e., fairness, accountability, transparency, privacy) concerning the use of AI in education. It will furthermore discuss the challenge of addressing potential biases in AI algorithms so as to ensure fair access and outcomes for all learners. Finally, the unit will address legal and ethical considerations connected to the collection, storing, and using of student data in AI systems.

Competencies:

General competencies

- Students understand the key concepts of AI and know about its development
- Students are able to identify and explore both benefits as well as challenges of AI in education
- Students are aware of data privacy issues related to AI in education and explain ethical considerations related to them.
- Students are are familiar with differentAI tools suitable for use in teaching and learning settings
- Students are able to apply learning data so as to gain insights into learning performance and engagement.

Co-funded by the European Union

- Students are able to describe adaptive learning principles and personalized instruction techniques.

Specific competencies

- Students can list different AI-powered educational tools, such as intelligent tutoring systems, automated assessment systems, and AI-powered learning platforms
- Students are able to analyze adaptive learning paths and use them in learning management systems
- Students can use AI to provide feedback
- Students are able to create initial learning environments for human-AI collaboration
- Students know ethical frameworks and guidelines for using AI in education
- Students can outline data security and privacy regulations related to AI-based learning

Soft competencies

- Students have basic thinking and problem-solving skills related to the use of AI in education
- Students have initial communication and collaboration skills for human-AI interaction
- Students are able to present changes in the consistently evolving landscape of AI in education
- Students consider ethical considerations and a sense of responsibility related to the use of AI in education

Intended learning outcomes:

Students remember

- Upon completion of this course, students can list the basic concepts of AI and describe its history
- Upon completion of this course, students can list the benefits and challenges of using AI in education
- Upon completion of this course, students can define AI-powered tools for lesson planning, student engagement, and adaptive learning strategies.
- Upon completion of this course, students can define the fundamental principles of adaptive learning
- Upon completion of this course, students have memorized ethical frameworks and principles related to the use of AI in education

Students understand

- Upon completion of this course, students will be able to explain the impact the use of AI may have on teachers and learners
- Upon completion of this course, students can outline the concepts of simple personalization algorithms and explain how they are used to tailor content, pace, and learning activities
- Upon completion of this course, students can explain how AI may help with content recommendations and the delivery relevant resources
- Upon completion of this course, students recognize the ethical and pedagogical complexities that accompany the use of AI in education

Co-funded by the European Union

- Upon completion of this course, students can explain the importance data security and privacy play in AI-based learning and teaching settings

Students apply

- Upon completion of this course, students implement AI-driven assessment and feedback tools to optimize student learning outcomes
- Upon completion of this course, students operate AI-based tutoring systems, chatbots, and virtual assistants in education
- Upon completion of this course, students identify techniques to collect, analyze, and interpret student data in order to understand learning patterns and thus gain insights
- Upon completion of this course, students use visualizations of learning data to communicate insights to educators and stakeholders.
- Upon completion of this course, students apply ethical principles to AI integration in teaching to ensure fairness, privacy, and responsible AI use

Students analyze

- Upon completion of this course, students use different design principles for building adaptive learning systems
- Upon completion of this course, students assess the effectiveness of AI tools in educational settings and recommend best practices for AI-assisted learning

Students evaluate

- Upon completion of this course, students test the effectiveness of Learning Management Systems (LMS) to provide personalized guidance, feedback, and support
- Upon completion of this course, students understand fundamental implications of AI for fairness, accountability, transparency, and privacy in education
- Upon completion of this course, students can identify the challenges and limitations of AI in education

Students create

- Upon completion of this course, students develop AI-supported learning experiences
- Upon completion of this course, students explain strategies to promote the responsible use of AI in education

Learning and teaching methods:

- Online lectures
- Readings and online discussions
- Case Study

Co-funded by the European Union

- Workshops and practical exercises
  Hands-on workshops, in which students experiment with AI tools, deepen their technical understanding and practical application skills.
- Simulations and role plays:
  Simulation scenarios and role-plays in which students take on the roles of teachers, or AI systems provide practical insights into the dynamics of human-AI interactions.
- Project-based learning
  Students work on projects in which they use AI tools to solve problems in the education sector. This promotes practical learning and the development of specific skills.
- Expert talks and guest lectures
  Through lectures by experts in the field of AI and education, students gain insights into current developments and practical applications. This method strengthens the application orientation and promotes exchange.

Readings:

Mandatory readings

Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. European Journal of Education, 57(4), 542-570.

Optional readings:

Ayeni, O. O., Al Hamad, N. M., Chisom, O. N., Osawaru, B., & Adewusi, O. E. (2024). AI in education: A review of personalized learning and educational technology. GSC Advanced Research and Reviews, 18(2), 261-271.

Evaluation

Weight (in %)	**Assessment:**
60%	**Multiple-Choice Test based on lecture material and pre-readings**
40%	**Case Study incl. online discussions and question answering**

4.4.2 IVET

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

Co-funded by the European Union

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

Course type	

University / school course code:	

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
X					X	5

Lecturer:	TBD

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 explores the potential of "Human-AI Collaboration in Teaching and Learning". In three modules à three teaching units, it will address the use of AI learning and teaching tools, the pedagogies of human-centered, AI-

Co-funded by the European Union

supported learning, as well as respective ethical regulations. The goal is to prepare existing and future teachers for a world where AI-supported teaching and learning becomes the norm rather than the exception.

Module 1: Introduction to AI in Education & AI-Assisted Learning and Teaching Tools

This module provides an overview of the growing field of Artificial Intelligence (AI) in education. Students will learn about AI's potential and explore practical applications of AI-powered tools for enhancing learning and teaching experiences. The module is sub-divided into the following three units:

Unit 1.1: AI and its Role in Education

This unit will introduce students to AI core concepts, definitions (e.g. narrow AI vs. general AI) and functionalities (e.g., AI learning, AI reasoning, AI problem solving) as well as discuss historical AI developments and current trends. Furthermore, it will provide an overview of the most common applications for AI technology in teaching and learning settings (i.e., automatization, data analytics and personalization).

Unit 1.2: AI in Student Assessment and Feedback

This unit will introduce students to different AI tools they can use to analyze learning progress and consequently identify learning gaps. Also, the unit will cover automatic feedback tools and how they may effectively be used in Human-AI collaborative learning settings.

Unit 1.3: AI-based Tutoring Systems, Chatbots and Virtual Assistants in Education

This unit will particularly focus on AI-based conversational tutoring systems. Students will be able to experience different types of educational chatbots and virtual assistants so as to better understand both their influence on learners' learning experiences as well as their potential challenges and technical limitations.

Module 2: AI for Personalized Learning and Adaptive Systems

This module explores the potential of AI in creating personalized learning experiences and adaptive educational systems. Students will learn about the theory and practice of AI-driven tools that address individual student needs, optimize learning pathways, and provide valuable insights for educators. The module is sub-divided into the following three units:

Unit 2.1: Adaptive Learning Technologies

This unit introduces students to the foundations of AI-supported adaptive learning, thereby covering rule-based as well as machine-learning based approaches. Furthermore, it will explore ways to tailor content, pace and learning activities to learners' personal needs and preferences. To this end, it will also discuss AI-tools that help identify additional resources and learning materials adjusted to individuals' learning progress.

Unit 2.2: AI-Powered Learning Management Systems (LMS)

This unit will cover AI-powered Learning Management Systems and how they should be designed and implemented so that they not only provide students with relevant learning material but rather offer personalized guidance, feedback and support. The unit concludes with a case study of the successful implementation of an adaptive learning platform.

Unit 2.3: Data-Driven Insights in Learning

The last unit of this module focuses on generation of data-driven insight. It will discuss different tools and methods for collecting, analyzing and interpreting student data and thereby help to understand distinct learning patterns. This will provide the necessary foundation to identify students who are at-risk of failing and thus require proactive

Co-funded by the European Union

interventions. Finally, the unit will also cover visualization techniques that can be used to communicate insights to educators and other stakeholders.

Module 3: Ethical and Pedagogical Considerations

This module focuses on ethical and pedagogical challenges connected to AI-supported education. Students will thereby examine the benefits and challenges of integrating AI tools into educational settings. The focus shall be on supporting effective human-AI collaboration while upholding ethical principles and ensuring data security. The module is sub-divided into the following three units:

Unit 3.1: Integration of AI in teaching settings

This unit will introduce students to different teaching strategies which effectively leverage AI so as to promote student engagement. In doing so, it will provide future educators with the knowledge and skills to use AI tools both confidently and responsibly and thus help create inclusive human-AI collaborative learning spaces.

Unit 3.2: Human-AI Collaboration in the Classroom

Based on the first unit of this module, the second unit will discuss the different, often complementary roles of teachers and AI in learning settings. It will also cover the challenges of peer learning in AI-enhanced learning environments and thus shall trigger critical reflections concerning the pros and cons of using AI in the classroom.

Unit 3.3: Ethics in AI for Education & Privacy and Data Security in AI-Based Learning Systems

Finally, the last unit of this module will examine ethical principles (i.e., fairness, accountability, transparency, privacy) concerning the use of AI in education. It will furthermore discuss the challenge of addressing potential biases in AI algorithms so as to ensure fair access and outcomes for all learners. Finally, the unit will address legal and ethical considerations connected to the collection, storing, and using of student data in AI systems.

Competencies:

General competencies

- Students understand the key concepts of AI and know about its development
- Students have the ability to critically evaluate both benefits as well as challenges of AI in education
- Students are aware of ethical considerations and data privacy issues related to AI in education
- Students are able to effectively integrate AI tools into teaching and learning settings
- Students are capable of analyzing learning data so as to gain insights into learning performance and engagement.
- Students know how to employ adaptive learning principles and personalized instruction techniques.

Specific competencies

- Students are familiar with different AI-powered educational tools, such as intelligent tutoring systems, automated assessment systems, and AI-powered learning platforms
- Students are able to design and integrate adaptive learning paths into learning management systems

Co-funded by the European Union

- Students can use AI to provide personalized feedback and support to learners
- Students are able to create inclusive learning environments for human-AI collaboration
- Students know relevant ethical frameworks and guidelines for using AI in education
- Students are aware of data security and privacy regulations related to AI-based learning

Soft competencies

- Students show critical thinking and problem-solving skills related to the use of AI in education
- Students exhibit relevant communication and collaboration skills for effective human-AI interaction
- Students are able to navigate and adapt to the consistently evolving landscape of AI in education
- Students know how to ethically and responsibly make decision related to the use of AI in education

Intended learning outcomes:

Students remember

- Upon completion of this course, students can list the basic concepts of AI and describe its history
- Upon completion of this course, students can list the benefits and challenges of using AI in education
- Upon completion of this course, students can define AI-powered tools and state their potential applications to enhance learning and teaching experiences
- Upon completion of this course, students can define the fundamental principles of adaptive learning
- Upon completion of this course, students have memorized ethical frameworks and principles related to the use of AI in education

Students understand

- Upon completion of this course, students can discuss the impact the use of AI may have on teachers and learners
- Upon completion of this course, students can outline the concepts of different personalization algorithms and explain how they are used to tailor content, pace, and learning activities
- Upon completion of this course, students can explain how AI may help with content recommendations and the delivery relevant resources
- Upon completion of this course, students will can explain how predictive modeling may help in identifying at-risk students and providing respective interventions
- Upon completion of this course, students recognize the ethical and pedagogical complexities that accompany the use of AI in education
- Upon completion of this course, students can explain the importance data security and privacy play in AI-based learning and teaching settings

Students apply

Co-funded by the European Union

- Upon completion of this course, students use AI-powered tools for learner assessment and feedback
- Upon completion of this course, students operate AI-based tutoring systems, chatbots, and virtual assistants in education
- Upon completion of this course, students implement techniques to collect, analyze, and interpret student data in order to understand learning patterns and thus gain insights
- Upon completion of this course, students use visualizations of learning data to communicate insights effectively to educators and stakeholders.
- Upon completion of this course, students demonstrate the application of ethical considerations when implementing human-AI collaboration in the classroom

Students analyze

- Upon completion of this course, students compare different design principles for building adaptive learning systems
- Upon completion of this course, students contrast benefits and challenges of integrating AI tools in educational settings

Students evaluate

- Upon completion of this course, students judge the effectiveness of Learning Management Systems (LMS) to provide personalized guidance, feedback, and support
- Upon completion of this course, students estimate the implications of AI for fairness, accountability, transparency, and privacy in education
- Upon completion of this course, students can assess the challenges and limitations of AI in education

Students create

- Upon completion of this course, students design and implement AI-supported learning experiences
- Upon completion of this course, students develop strategies to promote the responsible use of AI in education

Learning and teaching methods:

- Online lectures
- Readings and online discussions
- Case Study
- Workshops and practical exercises
  Hands-on workshops, in which students experiment with AI tools and develop their own application scenarios, deepen their technical understanding and practical application skills.

Co-funded by the European Union

- Simulations and role plays:
  Simulation scenarios and role-plays in which students take on the roles of teachers, developers or AI systems provide practical insights into the dynamics of human-AI interactions.
- Project-based learning
  Students work on real projects in which they use AI tools to solve problems in the education sector. This promotes practical learning and the development of specific skills.
- Peer teaching and learning
  Students independently take on the presentation of a topic or unit and transfer this knowledge to their fellow students. This promotes understanding and strengthens communication skills.
- Expert talks and guest lectures
  Through lectures by experts in the field of AI and education, students gain insights into current developments and practical applications. This method strengthens the application orientation and promotes exchange.

Readings:

Mandatory readings

Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. European Journal of Education, 57(4), 542-570.

Optional readings:

Ayeni, O. O., Al Hamad, N. M., Chisom, O. N., Osawaru, B., & Adewusi, O. E. (2024). AI in education: A review of personalized learning and educational technology. GSC Advanced Research and Reviews, 18(2), 261-271.

Evaluation

Weight (in %)	**Assessment:**
60%	**Multiple-Choice Test based on lecture material and pre-readings**
40%	**Case Study incl. online discussions and question answering**

Co-funded by the European Union

4.5 Synthetic Patient Records: how and why?

4.5.1 CVET

COURSE SYLLABUS								
Course title:	Synthetic Patient Records: how and why?							
Study program and level		**Study field**			**Academic / school year**		**Semester**	
CVET		HEALTH SECTOR			2.,3.		4.,6.	
Course type				MOOC				
University/school course code:								
Lectures	**Seminar**	**Tutorial**	**Work**	**Other work**	**Individual work**			**ECTS**
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.

Co-funded by the European Union

Content (Syllabus outline):

This course 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 requirements, and how these requirements are affecting practices. The emphasis is on highlighting basic approaches within the context of the workplace.

By the end of the course, students 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 following topics provide the necessary details:

1. Module: Case Studies

After a brief introduction to AI's general context, students review specific case studies within the healthcare industry.

1.1. UNIT: Introduction to AI

In this short unit, cVET students 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. UNIT: Introduction to the usage of AI in the health sector

In this unit, students will delve deeper into the transformative role of AI in healthcare and explore current applications and future trends. Students 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, students may gain a comprehensive understanding of the benefits and challenges related to the adoption of new technologies in healthcare settings.

1.3. UNIT: Real-world case study

During this unit, students 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, students 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 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. Students 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

Co-funded by the European Union

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.

2.1. UNIT: The properties of Synthetic data

Within this unit, students 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

2.2. UNIT: Techniques and tools to generate synthetic data

Many tools and synthetic datasets are available for free. This unit teaches students 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.

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.

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.

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.

3.3: UNIT: Putting it all together

The critical themes described in previous topics are summarised in the concluding unit. New examples are presented, and a personal project will be assigned to update the student on the current situation with AI in the health sector. In this final unit, students will synthesize the knowledge acquired throughout the course, reflecting on the transformative impact of AI in the health sector and the importance of ethical and regulatory considerations.

Co-funded by
the European Union

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

- **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. Explain the principal concepts associated with synthetic data, its importance, and its applications in the health sector, including how it differs from real-world data.

Co-funded by the European Union

L2. Define the structure of patient records.

L3. Use tools to generate synthetic health datasets using statistical modelling and machine learning methods, ensuring the data mimics real-world health data characteristics.

L4. Visualise patient populations within the synthetic data using open-source tools

L5. Evaluate the quality of the synthetic data using visual methods.

L6. Outline the fundamental motivations of the EC and provisions of the EU AI Act concerning the application of AI within the health sector, including how synthetic data is a mitigation action that supports the legality of deploying AI solutions within the industry

L7. Perform systematic desktop reviews of the current status of AI within the Health Sector

L8. Understand digital health legislation framework and how EU regulation affects AI in healthcare

Learning and teaching methods:

- Online Lecture-Based
- Problem-Based Exercises
- Case Study
- Simulated Environment / Technology enhanced
- Collaborative Exercises
- Formative and summative assessment
- Group based exercises

Readings:

Mandatory readings:

- 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

Co-funded by the European Union

- [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 % - 15 % - 0 % - 15 %	- Multiple Choice KEY learning outcomes, prerequisites - Written Assignment: The Good and Bad of AI within the Health Sector. - Multiple Choice - Group Assignment: The changing face of ethics in the Health sector
Synthetic Data - 0 % - 15 % - 15% - 0%	- Multiple Choice L1 - Written Assignment: Visualizing health statistics L2,L3,L4 - Group Assignment: Market research on synthetic usage within the health sector L7 - Multiple Choice L1,L5
Ethics and Regulatory Constraints - 0 %	- Multiple Choice L1,L2,L4,L8

Co-funded by the European Union

- 15 % - 25 %	- Project: Given Scenario X, My advice to a health organisation is … L6,L7 - Written Assignment: AI within the HEALTH sector L1,L2,L5,L6,L8

4.5.2 IVET

COURSE SYLLABUS			
Course title:	Synthetic Patient Records: how and why		
Study program and level	**Study field**	**Academic / school year**	**Semester**
IVET	HEALTH SECTOR	2.,3.	4.,6.
Course type	MOOC		
University/school course code:			

Lectures	**Seminar**	**Tutorial**	**Work**	**Other work**	**Individual work**		**ECTS**
x (Online)			x	x	x		5

Lecturer:	

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

Co-funded by the European Union

Prerequisites:

A curiosity about the uses of AI.

Content (Syllabus outline):

Co-funded by
the European Union

This course examines the impact of AI on the health sector and how synthetic (fake) data are becoming a best practice for working with AI in a host of situations. The details include motivation, technologies, legal requirements, and how these affect practices. The emphasis is on highlighting basic approaches within the context of the workplace.

By the end of the course, students 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 following modules provide the necessary details.

1. Module: Case Studies

After a brief introduction to AI's general context, students review specific case studies within the healthcare industry.

1.1. UNIT: Introduction to AI

This short unit introduces IVET students 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. UNIT: Introduction to the usage of AI in the health sector

In this unit, students will delve deeper into the transformative role of AI in healthcare, and explore current applications and future trends. Students 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, students can gain a comprehensive understanding of the benefits and challenges related to the adoption of new technologies in healthcare settings.

1.3. UNIT: Real-world case study

During this unit, students 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, students 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 UNIT: Balancing innovation with patient safety: ethical considerations and regulatory challenges

This unit explores the best practices that have led to successful AI deployment in the health Industry. We will discuss the ethical principles guiding the development and deployment of AI technologies, such as patient consent, privacy, and data security. Legal considerations will also be examined, focusing specifically on compliance with data protection regulations and their impact on product development. Students 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.

Co-funded by the European Union

2.1. UNIT: The properties of Synthetic data

This unit explores the problems synthetic data is known to address within the health sector and the basic properties of artificial data. The specific focus is on rule-based and distribution-based data. The unit details how security is enhanced and legal requirements may be relaxed. Finally, the uses of synthetic data in training and specific real-world scenarios are discussed.

2.2. UNIT: Techniques and tools to generate synthetic data

Many tools and synthetic datasets are available for free. This unit teaches students what is available and how the data, in combination with tools, are often used. Emphasis is placed on using available data and tools, visualization, and deployment scenarios.

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

This unit uses 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. Additionally, the limitations and challenges associated with synthetic data, such as ensuring data validity, and through validity utility, will be critically analyzed to provide a balanced understanding of the deployment of AI 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.

3.1. UNIT: Introduction to the EU AI Act and other legislative frameworks

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.

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. The students will discuss how these regulations define medical devices and diagnostics and the specific safety, performance, and quality standards they impose. The 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.

3.3: UNIT: End-To-END view of Synthetic Patient Data

The critical themes described in previous topics are summarised and combined. New examples are presented, and a personal project will be assigned to update the student on the current situation with AI in the health sector. The student will synthesize the information acquired throughout the course, reflecting on the transformative impact of AI in the health sector and the importance of ethical and regulatory considerations.

Competencies:

Co-funded by the European Union

General competencies

- **Ethical awareness:** Details the central ethical themes around working with new technologies.
- **Desk 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

- **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 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 optimizes 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 framework:** 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 visualize AI-related health data.

Soft competencies

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

Intended learning outcomes:

Co-funded by the European Union

L1. Explain 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. Define the structure of patient records.

L3. Using statistical modelling and machine learning methods, use tools to generate synthetic health datasets, ensuring the data mimics real-world health data characteristics.

L4. Visualize patient populations within the synthetic data using open-source tools

L5. Evaluate the quality of the synthetic data using visual methods.

L6. Outline the fundamental motivations of the EC and provisions of the EU AI Act concerning the application of AI within the health sector, including how synthetic data is a mitigation action that supports the legality of deploying AI solutions within the industry

L7. Perform systematic desktop reviews of the current status of AI within the Health Sector

L8. Develop prompts for AI that generate realistically looking synthetic data for the health sector

L9. Explain the steps to managing data within the health sector

L10. Understand digital health legislation framework and how EU regulation affects AI in healthcare.

Learning outcomes for the **Introduction to AI** unit linked here

Learning and teaching methods:

- Online Lecture-Based
- Problem-Based Exercises
- Case Study
- Simulated Environment / Technology enhanced
- Collaborative Exercises
- Formative and summative assessment
- Group based exercises
- Group discussions

Readings:

Mandatory readings

Optional readings

Co-funded by the European Union

- Introduction to Artificial Intelligence – World Travel & Tourism Council

Evaluation

Formative test = 0%
Summative tests > 0%

Weight (in %)	Assessment:
Context - 0 % - 15 % - 0 % - 10 %	- Multiple Choice KEY learning outcomes, prerequisites - Written Assignment: The Good and Bad of AI within the Health Sector. - Multiple Choice - Group Assignment: The changing face of AI in Industry
Synthetic Data - 0 % - 15 % - 10% - 0%	- Multiple Choice L1 - Written Assignment: Visualizing health statistics L2, L3,L4,L9 - Group Assignment: Prompting AI and visualizing. L7,L8 - Multiple Choice L1,L5,L9
Ethics and Regulatory Constraints - 0 % - 15 %	- Multiple Choice L1,L2,L4,L9, L10 - Project: Given Scenario X, My advice to a health organisation is ... L6,L7

Co-funded by the European Union

- 20 %	- Written Assignment: AI within the HEALTH sector L1,L2,L5,L6,L8,L9, L10

Co-funded by
the European Union

4.6 Advanced Enhancing Doctor-Patient Interactions with AI

4.6.1 CVET

COURSE SYLLABUS	
Course title:	Advanced Enhancing Doctor-Patient Interactions with AI

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

Course type	CVET - Medical Training in AI
University / school course code:	

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
						3

Lecturer:	
Language of the Lectures:	English/ national language

Co-funded by the European Union

Language of the Tutorial:	English/ national language

Prerequisites:

?

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.

The following modules are especially emphasized:

Module 1: Introduction to Challenges in Doctor-Patient Interactions

Unit 1: Broad Issues in Doctor-Patient Interactions

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.

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.

Co-funded by the European Union

- 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.

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.

Unit 2: Ethical Issues and Regulatory Compliance

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

Co-funded by the European Union

professional standards. Ethical lapses can erode trust, discourage patient engagement, and potentially lead to legal repercussions.

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.

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.

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.

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

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

Co-funded by the European Union

the administrative burden on clinicians and improve patient understanding, ultimately contributing to better clinical outcomes.

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.

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.

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.

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.

Co-funded by the European Union

Module 2: Case Study – Communication Barriers

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

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.

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.

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.

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.

Unit 2: Language Barriers and Translating Instructions

Co-funded by the European Union

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.

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.

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.

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.

Unit 3: Using Generative AI for Medical Procedure Image Generation

Role of Visual Aids in Patient Education

Co-funded by the European Union

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.

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.

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.

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.

- **<u>Module 3 / Case Study 2: Medical Adherence</u>**

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

Co-funded by the European Union

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:

Co-funded by the European Union

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.

Co-funded by the European Union

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:

General Competencies:

1. **Advanced Data Literacy**
    - Interpreting and validating AI-generated medical recommendations
2. **Critical AI Assessment:**
    - Differentiating between clinically valid AI insights and biased outputs.
3. **Regulatory Compliance & Ethics:**
    - Navigating AI integration within legal and professional frameworks.
4. **Clinical Decision Support:**
    - Applying AI-driven diagnostics while maintaining clinical judgment.

Specific Competencies:

Co-funded by the European Union

1. **AI-Assisted Clinical Communication:**
    - Leveraging AI to optimize consultations and patient education.
2. **Data-Driven Decision-Making:**
    - Using AI tools for real-time patient monitoring and early intervention.
3. **Ethical Use of AI in Medicine:**
    - Ensuring AI applications align with patient autonomy and privacy standards.
4. **Personalized Patient Care Strategies:**
    - Tailoring AI solutions to enhance patient-centric care.

Soft Competencies:

1. **Empathetic AI Integration:**
    - Maintaining human-centered communication in AI-assisted interactions.
2. **Interdisciplinary Collaboration:**
    - Engaging with AI developers to refine healthcare applications.
3. **Technological Adaptability:**
    - Staying current with evolving AI tools and clinical applications.

Intended learning outcomes:

- Assess communication barriers in complex medical scenarios.
- Integrate AI-based clinical tools for improving patient dialogue and information-sharing.
- Evaluate ethical considerations surrounding AI-based decision support systems.
- Evaluate AI-driven solutions for bridging linguistic and cultural gaps in patient interactions.
- Implement AI-enhanced patient education strategies tailored to diverse populations.
- Assess the limitations of AI in replacing human-led patient explanations.
- Develop AI-assisted interventions for improving long-term treatment adherence.
- Analyze patient data patterns to identify and address non-adherence risks.
- Evaluate AI's role in increasing engagement in chronic disease management.
- Critically analyze AI bias and its impact on patient care.
- Develop strategies to enhance patient trust in AI-powered healthcare tools.
- Implement ethical AI guidelines within clinical practice.

Co-funded by the European Union

Learning and teaching methods:

1. Interactive Lectures

Description: Lectures supplemented with multimedia (videos, animations, interactive presentations) to explain core concepts such as challenges in doctor-patient communication, cultural influences, and the basics of AI technologies.

Why?: Simplifies complex topics, provides visual aids, and maintains student engagement.

2. Case-Based Learning (CBL)

Description: Students analyze real-world or hypothetical case studies, such as a patient missing doses of medication due to misunderstanding instructions. Discussions focus on identifying barriers and proposing AI-driven solutions.

Why?: Encourages critical thinking, problem-solving, and application of knowledge to real-life scenarios.

3. Role-Playing and Simulations

Description: Students take on roles as patients, doctors, or AI developers to practice communication strategies and understand the dynamics of doctor-patient interactions.

Example: Simulating a scenario where an AI chatbot assists a doctor in explaining a treatment plan to a patient with low health literacy.

Why?: Enhances empathy, interpersonal skills, and understanding of AI's potential role in healthcare.

4. Group Projects and Collaboration

Description: Students work in small teams to design simple AI-driven tools or workflows that improve specific aspects of doctor-patient interactions (e.g., a reminder system for medications).

Why?: Promotes teamwork, creativity, and a hands-on understanding of AI's applications.

5. Workshops and Hands-On Activities

Description: Practical workshops on basic AI tools, such as using healthcare apps or understanding how AI supports decision-making.

Example: Demonstrating AI-powered platforms like Medisafe or introducing basic machine learning concepts tailored for vocational students.

Why?: Provides practical exposure to AI, making abstract concepts more relatable.

6. Multimedia Assignments

Description: Students create videos, infographics, or presentations explaining how AI can address challenges in doctor-patient interactions.

Why?: Encourages creativity, reinforces understanding, and allows students to communicate ideas effectively.

7. Peer Teaching

Description: Students research specific topics (e.g., communication barriers or AI in medication adherence) and present them to their peers.

Why?: Develops research skills, confidence, and a deeper understanding of the subject.

Co-funded by the European Union

8. Guest Speakers and Expert Panels

Description: Inviting healthcare professionals and AI experts to discuss the practical use of AI in improving doctor-patient relationships.

Why?: Provides real-world insights and inspiration for students about future careers.

9. Problem-Based Learning (PBL)

Description: Students are given open-ended problems (e.g., improving medication adherence in elderly patients) and must research and propose AI-driven solutions.

Why?: Develops analytical thinking and autonomous learning.

10. Reflection and Feedback Sessions

Description: Students write reflections on their learning experiences or participate in group discussions to share feedback on AI tools and methods.

Why?: Encourages self-awareness and continuous improvement.

11. Online Learning and Virtual Tools

Description: Incorporating AI simulation software or virtual platforms that mimic doctor-patient interactions.

Why?: Offers an immersive experience, especially when in-person interactions are limited.

12. Evaluation through Real-World Applications

Description: Assess students by having them design small projects, like patient education videos or basic chatbot workflows, to address specific challenges in doctor-patient interactions.

Why?: Reinforces knowledge through application and gives tangible results.

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 AIbased Innovators. Technological Forecasting and Social Change 178, 2022.

Evaluation	
Weight (in %)	**Assessment:**

Co-funded by the European Union

50% 50%	Written Assessment Oral Assessment

4.6.2 IVET

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	ECTS
						5

Lecturer:	
Language of the Lectures:	English/ national language

Co-funded by the European Union

Language of the Tutorial:	English/ national language

Prerequisites:

None

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.

The following modules are especially emphasized:

Module 1: Introduction to Challenges in Doctor-Patient Interactions

Unit 1: Broad Issues in Doctor-Patient Interactions

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.

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.

Co-funded by the European Union

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.

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.

Unit 2: Ethical Issues and Regulatory Compliance

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

Co-funded by the European Union

professional standards. Ethical lapses can erode trust, discourage patient engagement, and potentially lead to legal repercussions.

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.

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.

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.

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

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

Co-funded by the European Union

the administrative burden on clinicians and improve patient understanding, ultimately contributing to better clinical outcomes.

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.

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.

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.

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.

Co-funded by the European Union

Module 2: Case Study – Communication Barriers

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

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.

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.

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.

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.

Co-funded by the European Union

Unit 2: Language Barriers and Translating Instructions

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.

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.

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.

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.

Unit 3: Using Generative AI for Medical Procedure Image Generation

Role of Visual Aids in Patient Education

Co-funded by the European Union

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.

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.

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.

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.

- **<u>Module 3 / Case Study 2: Medical Adherence</u>**

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

Co-funded by the European Union

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.

Co-funded by the European Union

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:

Co-funded by the European Union

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. General Competencies

a) Basic Digital Literacy

Learners must be comfortable using digital devices, basic healthcare apps, and online platforms. Before using AI tools, a solid understanding of general digital environments is essential.

b) Fundamental AI Awareness in Healthcare

Students should understand basic concepts of AI (e.g., machine learning, chatbots) and how these are starting to impact healthcare delivery, without needing technical depth.

Co-funded by the European Union

c) Understanding the Role of Communication in Patient Care
Students must recognize that communication is as vital as diagnosis and treatment. Knowing the impact of language, empathy, and clear explanations in healthcare is foundational.

2. Specific Competencies

a) Recognizing AI Tools for Patient Support
Learners should be able to identify simple AI tools like translation apps, symptom checkers, or reminder systems that assist in communication or adherence.

b) Data Privacy Basics and Patient Confidentiality
Students need to understand the importance of keeping patient data private, learning about consent and confidentiality rules at a basic level (e.g., why sharing information over WhatsApp might be inappropriate).

c) Identifying Communication Barriers
Students must learn how language differences, cultural backgrounds, and emotional states create challenges in communication — and how AI might help overcome these barriers.

3. Soft Competencies

a) Developing Empathy in Technology-Assisted Interactions
Even when using AI tools (like translation apps or chatbots), learners must maintain a human-centered approach — showing warmth, patience, and understanding to patients.

b) Team Collaboration and Communication
Working with classmates (or future healthcare teams) will teach students how different roles (doctors, nurses, IT staff) collaborate — especially when using AI-based tools.

c) Openness to Learning and Change
Because AI in healthcare evolves quickly, students should cultivate a mindset of lifelong learning, adaptability, and curiosity to stay relevant and competent in future workplaces.

Intended learning outcomes:

- Describe basic concepts of Artificial Intelligence (AI) and its role in healthcare.
  Learners will be able to explain, in simple terms, what AI is and how it can support doctors and patients.

- Identify common communication barriers between doctors and patients.
  Learners will recognize how language, culture, emotions, or technology access can impact patient communication.

- Use basic digital tools to support patient interactions.
  Learners will demonstrate the ability to use simple apps (e.g., translation tools, reminder systems) during

Co-funded by the European Union

simulated patient interactions.

- **Explain the importance of confidentiality and safe data handling in healthcare settings.**
  Learners will describe why protecting patient information is crucial and name good practices.

- **Recognize ethical principles in doctor-patient-AI interactions.**
  Learners will understand the need for transparency, fairness, and patient respect when using technology in healthcare.

- **Demonstrate empathy when communicating with patients, both with and without AI support.**
  Learners will show awareness of emotional needs during simulated consultations.

- **Work collaboratively in a team to solve communication challenges using AI tools.**
  Learners will participate in group activities to create simple, AI-supported patient communication solutions.

- **Identify situations where AI tools can improve patient understanding and adherence.**
  Learners will recognize when a chatbot, a translated instruction, or a visual aid can help a patient better follow medical advice.

- **Reflect on personal attitudes toward using AI in patient care.**
  Learners will evaluate their feelings about technology's role in healthcare and discuss benefits and concerns.

- **Adapt communication styles to meet the needs of diverse patient populations.**
  Learners will practice adjusting their language, tone, and use of technology based on a patient's cultural and linguistic background..

Learning and teaching methods:

1. Interactive Lectures

Description: Lectures supplemented with multimedia (videos, animations, interactive presentations) to explain core concepts such as challenges in doctor-patient communication, cultural influences, and the basics of AI technologies.

Why?: Simplifies complex topics, provides visual aids, and maintains student engagement.

2. Case-Based Learning (CBL)

Description: Students analyze real-world or hypothetical case studies, such as a patient missing doses of medication due to misunderstanding instructions. Discussions focus on identifying barriers and proposing AI-driven solutions.

Why?: Encourages critical thinking, problem-solving, and application of knowledge to real-life scenarios.

Co-funded by the European Union

3. Role-Playing and Simulations

Description: Students take on roles as patients, doctors, or AI developers to practice communication strategies and understand the dynamics of doctor-patient interactions.

Example: Simulating a scenario where an AI chatbot assists a doctor in explaining a treatment plan to a patient with low health literacy.

Why?: Enhances empathy, interpersonal skills, and understanding of AI's potential role in healthcare.

4. Group Projects and Collaboration

Description: Students work in small teams to design simple AI-driven tools or workflows that improve specific aspects of doctor-patient interactions (e.g., a reminder system for medications).

Why?: Promotes teamwork, creativity, and a hands-on understanding of AI's applications.

5. Workshops and Hands-On Activities

Description: Practical workshops on basic AI tools, such as using healthcare apps or understanding how AI supports decision-making.

Example: Demonstrating AI-powered platforms like Medisafe or introducing basic machine learning concepts tailored for vocational students.

Why?: Provides practical exposure to AI, making abstract concepts more relatable.

6. Multimedia Assignments

Description: Students create videos, infographics, or presentations explaining how AI can address challenges in doctor-patient interactions.

Why?: Encourages creativity, reinforces understanding, and allows students to communicate ideas effectively.

7. Peer Teaching

Description: Students research specific topics (e.g., communication barriers or AI in medication adherence) and present them to their peers.

Why?: Develops research skills, confidence, and a deeper understanding of the subject.

8. Guest Speakers and Expert Panels

Description: Inviting healthcare professionals and AI experts to discuss the practical use of AI in improving doctor-patient relationships.

Why?: Provides real-world insights and inspiration for students about future careers.

9. Problem-Based Learning (PBL)

Description: Students are given open-ended problems (e.g., improving medication adherence in elderly patients) and must research and propose AI-driven solutions.

Why?: Develops analytical thinking and autonomous learning.

10. Reflection and Feedback Sessions

Co-funded by the European Union

Description: Students write reflections on their learning experiences or participate in group discussions to share feedback on AI tools and methods. Why?: Encourages self-awareness and continuous improvement. 11. Online Learning and Virtual Tools Description: Incorporating AI simulation software or virtual platforms that mimic doctor-patient interactions. Why?: Offers an immersive experience, especially when in-person interactions are limited. 12. Evaluation through Real-World Applications Description: Assess students by having them design small projects, like patient education videos or basic chatbot workflows, to address specific challenges in doctor-patient interactions. Why?: Reinforces knowledge through application and gives tangible results.

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 AIbased Innovators. Technological Forecasting and Social Change 178, 2022.

Evaluation

Weight (in %)	**Assessment:**
50%	**Written Assessment**
50%	**Oral Assessment**

Co-funded by the European Union

4.7 Using AI for personalized advertising campaigns

4.7.1 CVET

COURSE SYLLABUS	
Course title:	**Using AI for personalized advertising campaigns**

Study program and level	Study field	Academic / school year	Semester
Continuing Vocational Education and Training Program	Entrepreneurship and management	2025/2026	II

Course type	**CVET**
University / school course code:	Unina, pic code:999976590

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
1	0,5			0,5	1	3

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

Co-funded by the European Union

Prerequisites:

1. **Problem solving abilities –** being able to combine logical reasoning, emotional intelligence, adaptability, creativity and the ability to learn from past experiences.
2. **Critical Thinking basic abilities –** being able to assess situations assuming multiple perspectives, and to evaluate potential solutions to a specific issue.

Content (Syllabus outline):

This syllabus describes the main characteristics of a course dedicated to adults, professionals, or working people who want to improve (up-skill) their competences and skills, better understanding the AI potential for personalizing advertising campaigns in line with the complexity and ever-changing market trends. In doing so, the course has been organized around theoretical and practical activities, with a special focus on ethics and compliance challenges. This will make "adult learners" and "professionals" able to improve their professional development upskilling or reskilling themselves, improve their employability in different or new job markets, level of qualification and employment situation thanks to the lifelong learning and learning on the job methods. The course has been designed to offer to participants the possibility to skill, reskill or upskill themselves, gaining fundamental insights on advertising and the transformative potential of AI.

The course offers theoretical and practical insights to be used in a real work scenario to engage customers through personalized omnichannel communication. To this end, specific techniques and methods will be presented, to make participant able to recognize and use specific methodologies, practical applications/tools in real working contexts. To achieve, this goal participants will also practically implement the proposed frameworks and tools proving themselves with practical works/tasks.

Module 1: Introduction to AI-based Advertising

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. This will also emphasize the similarities and differences between traditional and AI-based campaigns. Participants will learn 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 blended essential capabilities needed to successfully approach an AI-based advertising campaign. Participants will be able to recognize which creative, analytical, and technical skills are required to design and execute AI-based advertising campaigns. Participants will be also introduced to the design,

Co-funded by the European Union

development, and implementation of highly targeted campaigns and to the potential of digital analytics and AI to create better manage content creation and personalization to improve campaign efficiency and ROI. By the end of the module, learners will understand how to use AI to enhance AD campaign personalization and to achieve better results, thanks to a smart approach to data analysis and automation.

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. The European key data protection laws (e.g., GDPR, General Data Protection Regulation) will be approached 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

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

This unit presents and discusses how advertising is getting digital. To this end, the grand challenge of digital transformation will be introduced and discussed, presenting some of the main related frameworks. The units also focus on how AI-based tools track and reveal individual behaviors and preferences, supporting managers and creators in creating AD campaign that can be dynamically adapted to specific and ever-changing targets. Some specific tools will be proposed to design a cross-channel adaptive advertisement campaign. 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. The importance of an Omni- and cross-channel integration (e.g., social media, digital platforms, websites, email) to design adaptive advertisement campaigns that engage consumers at each touchpoint will be discussed, together with implications for gaining higher conversion rates and customer satisfaction.

Unit 2.2 Personalization as a driver of customer loyalty

This unit introduce participants to the main concept of "customer engagement", intended as an essential pre-requisite for customers' retention and loyalty. The theoretical and practical activities point to describe the importance of "engagement" in advertising, focusing on the AI-tools ability/possibility to enhance customer experience by providing relevant, timely, and meaningful interactions, and on the influence that psychological aspects have on customer loyalty (e.g., customer satisfaction, trust, emotional connection, etc..). Some case studies and examples of companies using AI to enhancing customer loyalty will be presented and discussed, focusing on the importance of "evaluation" and the need to define and use some specific evaluation metrics.

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

Co-funded by the European Union

This unit focus on the integration of AI-driven hybrid approaches in advertising platforms to optimize customer engagement and personalization. The main AI-driven tools currently used in advertising (Google Ads, Facebook Ads, programmatic advertising, etc.) will be presented and some practical examples and case studies will offer a general overview of how to create effective and scalable personalized campaigns, focusing on the synergy between AI and traditional advertisement methods. The unit will also present and discuss the DCO (dynamic creative optimization) tools which use AI to dynamically generate and adjust AD content to suit different audiences.

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

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

This unit discuss the importance of data gathering and management in the design and implementation of highly personalized campaign, focusing on their importance for targeting. Different types of data involved in AI advertising will be presented together with some practical example of data sources and collecting methods, useful to define how personalize and optimize AD campaigns and get a higher ROI.

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

This unit offers an overview of the main techniques and AI algorithms used to deliver personalized experiences, focusing on how these analyze users' data to recommend products, services, and content that align with individual preferences. Some real case applications will be presented and discussed, focusing also on the related and technical challenges.

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

The unit delves on the possible implementation of generative AI models and simulations to predict customer behavior, campaign outcomes, and key metrics. Some case studies and good practices will be presented and discussed, focusing on some specific AD scenarios (e.g., digital entertainment services, gaming, fashion products, etc.). Some simulations of specific customer journeys will be presented.

Competencies:

General competencies

- Be aware of ethical issues, data privacy concerns, and compliance requirements related to the use of AI-based tools in AD campaigns.
- Be able to detect and challenge the main risks associated with AI-based AD campaigns.
- Be aware of the implications of AI-based tools for approach problem-solving and decision-making in advertisement campaigns.

Specific competencies

Co-funded by the European Union

- Quality orientation
- Planning and organizing
- Analysis
- Adaptability and change management
- Strategic thinking
- People development
- Entrepreneurial orientation
- Risk management

Soft competencies

- Creativity
- Adaptability
- Critical thinking
- Problem solving
- Communication
- Time management
- Interpersonal skills
- Leadership
- Business ethics

Intended learning outcomes:

- Understanding the main principles at the core of advertising personalization (e.g., relevance, individualization, contextual awareness, channel optimization, privacy and transparency, etc.)
- Analyzing and recognizing the main legal frameworks, the importance of compliance, and an ethical approach to AI-based advertising
- Understanding the AI potential for engaging customers and personalizing communication through CRM interactions, and feedback, machine learning, NLP, Dynamic Content Optimization, etc.
- Understanding and applying the main techniques and methods (Advanced Customer Segmentatio, Dynamic Content Generation, Personalized Product Recommendations, etc.) for AI-based personalized campaigns.

Learning and teaching methods:

Co-funded by the European Union

- 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., Wadhwani, 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.

Co-funded by the European Union

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**

4.7.2 IVET

COURSE SYLLABUS	
Course title:	**Using AI for personalized advertising campaigns**

Study program and level	**Study field**	**Academic / school year**	**Semester**
Postgraduate training	Management, digital marketing, communication	2025/2026	II

Course type	**IVET**
University / school course code:	Unina, pic code:999976590

Co-funded by the European Union

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
3	0,5			0,5	1	5

Lecturer:	n/a

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

Prerequisites:

1. **Problem-solving abilities –** being able to combine logical reasoning, emotional intelligence, adaptability, creativity, and the ability to learn from past experiences.
2. **Critical Thinking basic abilities –** being able to assess situations assuming multiple perspectives, and to evaluate potential solutions to a specific issue.

Content (Syllabus outline):

This syllabus describes the main characteristics of a course on AI potential for personalizing advertising campaigns in line with the complexity and ever-changing market trends. 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 into advertising and the transformative potential of AI, focusing on capabilities and resources essential for a successful AI-based advertising campaign. The course offers theoretical and practical insights to engage customers through personalized omnichannel communication. Finally, specific techniques and methods will be presented, focusing on specific methodologies, practical applications/tools, and real case studies. Students will be also able to practically implement the proposed frameworks and tools proving themselves with practical works/tasks, which will support them in accessing the current professional settings.

Module 1: Introduction to AI-based Advertising

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

Co-funded by the European Union

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. This will also emphasize the similarities and differences between traditional and AI-based campaigns. Students will learn 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 blended capabilities essential capabilities that are needed to successfully approach an AI-based advertising campaign. They will be able to recognize which creative, analytical, and technical skills are essential to design and execute AI-based advertising campaigns. In doing so students will be able to understand 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. By the end of the module, learners will gain an understanding of how to leverage AI capabilities—from data analysis to campaign automation—to enhance personalization and drive better results in advertising.

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. The European key data protection laws (e.g., GDPR, General Data Protection Regulation) will be approached 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

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. This will lead students to understand its main stages and the way customers approach it, interacting with a brand, contributing to its 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. The importance of an Omni- and cross-channel integration (e.g., social media, digital platforms, websites, email) to design adaptive advertisement campaigns that engage consumers at each touchpoint will be discussed, together with implications for gaining higher conversion rates and customer satisfaction.

Co-funded by the European Union

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. Some personalization strategies will be presented and discussed (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 better understand personalization, the related strategies, and tools will be presented and discussed with a focus on the influence that psychological aspects have on customer loyalty (e.g., customer satisfaction, trust, emotional connection, etc..). This unit also presents and discusses some case studies and best practices related to the use of AI-based tools to personalize AD communication. The unit will also focus on the assessment of personalized advertisement campaigns, presenting some possible KPIs to be used (e.g., su 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. Some examples and best practices will be presented to demonstrate how to gain and manage these approaches, focusing on the importance tof merging machine learning, rule-based systems, and data-driven models. This unit also offers insight into some specific methodologies and tools that make it possible to combine AI capabilities and traditional advertisement strategies to create effective and scalable campaigns. Finally, a general overview of the most common AI-driven tools that can be integrated with advertising platforms (Google Ads, Facebook Ads, programmatic advertising, etc.) will be presented, supporting a better understanding of how AI-based tools automate the buying and selling process at the core of digital AI-based campaign. In doing so, the DCO (dynamic creative optimization) tools, based on a dynamic use of AI applications will be discussed to recognize how to change content to make it in line with different audiences and socio-economic contexts.

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

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. Some insights will be offered to personalize AD messages and optimize targeting, analyzing customer behavior, preferences, and demographics. Different types of data involved in AI advertising, such as customer data (demographics, preferences), behavioral data (website interactions, clicks), contextual data (device, location), and transactional data (purchase history) will be presented, analyzed, and discusses, focusing on some of the most common methods of data collection and their implications for personalize and optimize AD campaigns and get a higher ROI.

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

Co-funded by the European Union

This unit offers an overview of the main techniques and AI algorithms used to deliver personalized experiences, focusing on how these 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). The unit also presents and discusses some AI algorithm implementations in specific real-world AD activities (e.g., product recommendation, content, or services creation, and possible performances), also focusing on the technical challenges associated with the use of these algorithms.

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

The unit presents 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 predict future advertising outcomes (e.g., Monte Carlo simulations, and agent-based modeling), supported by specific campaign scenarios and best practices. Finally, the creation, the characteristics, and the use of the synthetic customer data will be discussed focusing on their potential for predicting future trends or actions.

Competencies:

General competencies

- Be aware of ethical issues, data privacy concerns, and compliance requirements related to the use of AI-based tools in AD campaigns.
- The ability to detect and challenge the main risks associated with AI-based AD campaigns.
- Be aware of the implications of AI-based tools for approach problem-solving and decision-making in advertisement campaigns.

Specific competencies

- Quality Orientation
- Planning and organizing
- Analysis
- Adaptability and change management
- Strategic thinking
- People development
- Entrepreneurial orientation
- Risk management

Soft competencies

- Creativity

Co-funded by the European Union

- Adaptability
- Critical thinking
- Problem-solving
- Communication
- Time management
- Interpersonal skills
- Leadership
- Business ethics

Intended learning outcomes:

- Understanding the main principles at the core of advertising personalization
- Analyzing and recognizing the main legal frameworks, the importance of compliance, and an ethical approach to AI-based advertising
- Understanding 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

Co-funded by the European Union

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., Wadhwani, 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:**

Co-funded by the European Union

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

Co-funded by
the European Union

4.8 AI in Market Research

4.8.1 CVET

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	ECTS
30	30				30	3-5

Lecturer:	

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

Co-funded by the European Union

Prerequisites:

1. **Basic marketing knowledge** A general awareness of essential marketing concepts, such as understanding different market segments, identifying target audiences, and basic market insights.
2. **Introductory research skills** Understanding of basic research techniques that includes simple qualitative and quantitative techniques relevant to market research.
3. **Fundamental critical thinking principles** Basic ability to assess information thoughtfully and apply reasoning and storytelling, especially when exploring AI-driven research tools.

Content (Syllabus outline):

This syllabus provides focused learning on the role of AI in market research, equipping the participants with practical tools and frameworks to apply AI effectively in their workplace. It introduces core AI concepts and their applications in market analysis while addressing ethical and privacy concerns. Participants will learn foundational principles, practical techniques, and real-world use cases of AI in market research, gaining actionable skills in trend identification and sentiment analysis.

Module 1: Fundamentals of AI in market research

This module introduces students 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 1.1: 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 1.2: 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. Students 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 1.3: 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. Students 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

Co-funded by the European Union

is turning unstructured data into actionable insights, providing a complete view to participants regarding the value of AI in market research.

Module 2: 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 2.1: 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 2.2: 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. Students 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 2.3: 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. Students 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 3: 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 3.1: 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.

Co-funded by the European Union

- Unit 3.2: 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). Students 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 3.3: 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. Students 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**

Recognize and address common ethical concerns in AI, like bias, transparency, and the importance of consumer trust in the context of professional market research.

2. **Understanding data privacy concerns**

Familiarise with major data protection regulations (e.g., GDPR) and understand how to handle consumer data responsibly in a business environment.

4. **Applying AI to solve market research problems**

Learn how to apply AI techniques to address practical market research challenges, such as analyzing customer feedback or identifying market trends.

5. **Integrating AI tools in workplace processes**

Develop skills to integrate AI tools effectively into existing workflows to improve decision-making and enhance productivity.

Specific competencies

1. **Using selected AI tools in market research**

Gain hands-on experience with AI-driven tools and techniques, such as sentiment analysis, predictive modeling, and data visualization, to interpret market data accurately.

2. **Analysing real-world case studies**

Study practical applications of AI in market research, learning from industry success stories and avoiding common mistakes in implementing AI strategies.

Co-funded by the European Union

3. **Implementing data protection strategies:**

Develop specific skills to implement data security measures and maintain compliance with data protection laws during AI-driven research.

4. **Conducting basic sentiment analysis**

Apply natural language processing (NLP) tools to assess customer sentiment and derive actionable insights from large datasets.

5. **Forecasting trends using AI techniques**

Utilize AI methodologies like time-series analysis and customer segmentation to predict market trends and inform strategic planning.

Soft competencies

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

Develop the ability to explain AI concepts and their implications clearly to non-technical stakeholders in a professional setting.

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

Advocate for responsible AI practices within the workplace, encouraging adherence to ethical standards and transparency.

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

Cultivate flexibility and openness to adapt to new AI tools and methodologies as they evolve in the market research field.

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

Enhance the ability to assess complex market research problems, identify AI-driven solutions, and think creatively about implementation strategies.

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

Strengthen teamwork and interpersonal skills to work effectively in cross-functional teams integrating AI into market research practices.

Intended learning outcomes:

1. **Apply AI-driven analytics to optimize market research processes and extract consumer insights**:

Participants will be able to utilize AI tools to enhance data collection, trend analysis, and decision-making, improving market research efficiency and accuracy.

2. **Utilize AI-powered sentiment analysis, predictive modeling, and customer segmentation to enhance market research insights:**

Participants will be able to apply AI-driven techniques to interpret consumer behavior, identify emerging trends, and support data-driven decision-making.

Co-funded by the European Union

3. **Implement ethical AI practices in market research while ensuring compliance with data privacy laws like GDPR:**

Participants will be able to recognize and mitigate ethical challenges such as bias and transparency while adhering to industry standards and regulatory requirements.

4. **Apply AI-driven data protection techniques to safeguard consumer information and ensure regulatory compliance**:

Participants will learn how to utilize AI-powered risk mitigation strategies, such as automated anomaly detection, data encryption, and anonymization, to enhance data security and uphold ethical standards.

5. **Analyze AI-driven market research case studies to develop data-driven business strategies:**

Participants will critically analyze real-world applications of AI in market research and extract actionable insights to optimize marketing and business decision-making.

6. **Use AI techniques to predict market trends:**

Participants will utilize techniques such as time-series analysis and customer segmentation to identify and forecast emerging market trends.

7. **Communicate AI-driven insights effectively:**

Participants will develop the ability to present findings from AI-driven market research clearly and persuasively to diverse stakeholders, including non-technical audiences.

8. **Adapt to new AI technologies in market research:**

Participants will cultivate the flexibility to learn and apply emerging AI tools and techniques, ensuring their skills remain relevant in a rapidly evolving field.

9. **Collaborate on AI-integrated market research projects:**

Participants will be able to work in teams effectively, designing, conducting, and analyzing market research projects with AI technologies.

Learning and teaching methods:

1. **Interactive workshops:**

Hands-on workshops where the participants engage in the use of AI tools like sentiment analysis software, predictive modeling platforms, and data visualization. These workshops would focus on hands-on problem-solving scenarios applicable to their professional context.

2. **Cases study analysis:**

Participants review case studies of actual AI applications to successfully solve market research problems. This will promote critical thinking, discussion, and the capability of extracting actionable insights for similar challenges in their professions.

Practical Assignments:

Co-funded by the European Union

Regular assignments will include market data analysis with the help of AI tools, identification of trends, and presentation of findings. These tasks will reinforce learning outcomes and provide opportunities for immediate application in workplace settings.

3. **Group projects:**

Group projects will include the design and execution of an AI-driven market research initiative. This will enhance teamwork, project management, and the ability to integrate AI solutions into practical business strategies.

4. **Guest lectures**:

Industry professionals and AI practitioners will share their expertise, providing participants with insights into the latest trends, challenges, and innovations in AI-driven market research.

5. **Online discussions and forums:**

Dedicated online platforms will enable participants to engage in asynchronous discussions, share experiences, ask questions, and collaborate on assignments with peers from diverse professional backgrounds.

6. **Simulated market research scenarios:**

Participants will engage in simulated exercises that mimic real-world market research challenges. These simulations will allow them to apply AI techniques in a controlled, risk-free environment.

7. **Self-paced learning modules:**

Participants will have access to curated self-paced learning materials, including recorded tutorials, readings, and online resources, to accommodate their varying schedules and learning speeds.

8. **Feedback and reflection:**

Continuous feedback from instructors and peers will help participants refine their understanding and application of AI techniques. Reflection activities will encourage learners to evaluate their progress and identify areas for improvement.

Periodic quizzes and knowledge checks will assess participants' understanding of key concepts, ensuring they stay engaged and retain essential information.

Readings:

Mandatory Readings

1. Siegel, E. *Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die.* Wiley, 2016.
2. Müller, V. C. (Ed.). *Ethics of Artificial Intelligence and Robotics.* Stanford Encyclopaedia of Philosophy, 2020.
3. Paliwal, M. N., and Nishita C. "AI in Market Research: Transformative Customer Insights - A Systematic Review." In *Exploring the Intersection of AI and Human Resources Management*, 231–255. December 2023. Link.

Co-funded by the European Union

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." *International Journal of Intelligent Networks* 3 (2022): 119–132. Link.
5. Ameen, N., Tarhini, A., Reppel, A., and Anand, A. "Customer Experiences in the Age of Artificial Intelligence." *Computers in Human Behavior* 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. *Journal of Marketing*, 0(0). Link

Optional Readings

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**
10%	**Presentation of case study analysis**

4.8.2 IVET

COURSE SYLLABUS	
Course title:	AI in Market Research

Co-funded by the European Union

Study program and level	Study field	Academic / school year	Semester
Master's Degree Program in Digital Marketing	Marketing	2025./2026.	4.,1.

Course type	Elective course
University / school course code:	

Lectures	Seminar	Tutorial	Work	Other work	Individual work	ECTS
30	30	0	0	0	90	5

Lecturer:	n/a
Language of the Lectures:	English
Language of the Tutorial:	English

Prerequisites (Recommended):

1. **Basic marketing knowledge** A general awareness of essential marketing concepts, such as understanding different market segments, identifying target audiences, and basic market insights.
2. **Introductory research skills** Understanding of basic research techniques that includes simple qualitative and quantitative techniques relevant to market research.
3. **Fundamental critical thinking principles** Basic ability to assess information thoughtfully and apply reasoning and storytelling, especially when exploring AI-driven research tools.

Content (Syllabus outline):

Co-funded by the European Union

This syllabus introduces a comprehensive course on AI's transformative role in market research, guiding students from foundational principles to advanced analytical techniques and ethical considerations. The syllabus provides fundamental AI concepts, establishing a base in AI-driven data analysis for market insights. It then advances to practical applications, exploring trend identification and sentiment analysis, enriched by real-world case studies. Finally, a discussion of ethical and privacy concerns will provide students with methods for responsible AI integration in market research. These are some practical tools and frameworks that will enable the students to apply and use AI in a valid manner in their workplace.

Module 1: Fundamentals of AI in market research

This introductory module will provide a strong foundation in understanding of artificial intelligence, with a focus on how it can be used as a game-changer in the area of market research. In the module on essential AI concepts, methodologies, and data frameworks, students will be provided with the understanding on how AI technologies are rewriting the rules for analysis and interpretation of market data. After finishing this module, students will be offered examples on how the strategic implications are created by the application of AI in market research; the rest of the course modules will detail advanced applications.

- Unit 1.1: Introduction to AI Concepts for Market Research

This unit introduces the student to some of the fundamental concepts, theories, and frameworks that constitute the foundation of artificial intelligence, as modified for application in market research. In this unit, students will receive a general but detailed overview of the foundational AI concepts on machine learning, natural language processing, and data mining, and how each contributes to the insights achieved through artificial intelligence. Students will learn how AI-driven approaches support improved decision-making, foster adaptive strategies, and drive innovation in responding to evolving market conditions. The course will also focus on how the AI impinges on traditional market research methods and forms both a complementary and transformative force in the field..

- Unit 1.2: Key Terminology and Tools in AI-Driven Market Research

The unit examines the wider range of critical terminology and technological tools behind AI-driven market research. Students will be introduced with the basic concepts, such as algorithms, neural networks, deep learning, and predictive analytics, and how each contributes to the insights generated by AI. Moreover, the unit will introduce a suite of commonly used AI tools and platforms in the industry, including data visualisation software, predictive modelling tools, and machine learning libraries. Wherever practical, exercises will involve hands-on use of the tool to give students a more nuanced sense of how these can be used to analyse and interpret a complex data set for market research. By mastering these tools and terminologies, students will be well-prepared to engage with the AI methodologies and their applications in real-world research settings.

- Unit 1.3: Understanding Data in Market Research

This unit covers the types of different data used in market research, which include qualitative data from interviews and focus groups, quantitative data represented by surveys and empirical metrics, and unstructured data from social media posts and customer reviews. Market research taps all these sources, which are uniquely insightful into consumer behaviour and market trends. These will include the different advantages and disadvantages of each type of data, together with ways in which they are integrated to form a complete view of the marketplace. Special reference will be made to how AI is used to bring improvement in data processes, starting from data collection and cleaning to advanced analysis. It will help the students to understand how AI technologies can be applied to make many of the processes more efficient and accurate, thus enabling researchers to generate

Co-funded by the European Union

actionable insights faster and with more precision. They will be provided with, through case studies and hands-on examples, the understanding on how AI can change unstructured data into structured insights, showing the tremendous value of AI-driven approaches in extracting more holistic and deeper market perspectives.

Module 2: AI Techniques for Market Analysis

Building on core concepts in AI, this module will focus on practical AI techniques for advanced market analysis and equipping the student to detect emerging trends and measure consumer sentiment. By using theory and practice, students will investigate the potential for AI to explore complex market dynamics. Real-world case studies will be used to contextualise these techniques, demonstrating how AI is permeating market research practices and generating strategic decisions from this within sectors.

- Unit 2.1: Identifying Market Trends

This unit introduces essential techniques for identifying and analysing market trends, focusing on methods that allow businesses to stay ahead in competitive environments. Students will be introduced with core techniques, such as time-series analysis, sales forecasting, and customer segmentation, which are vital for detecting shifts in consumer behaviour and predicting market movements. Practical exercises will allow the student to practise these techniques on real historical data to develop perceptions of future trends and strategic opportunities. The consideration of case examples will demonstrate how to integrate these techniques into overall marketing strategies to respond proactively to changing market landscapes.

- Unit 2.2: Advanced Techniques for Market Research

The aim of this unit is to introduce students to advanced analysis techniques, such as sentiment analysis and predictive analysis, in order to assess consumer emotions and opinions, especially through various channels like social media, online reviews, and customer feedback. Advanced methodologies are discussed in this unit that include NLP and machine learning algorithms used in sentiment classification to enable a student to understand public sentiments precisely and in large volumes. By working with hands-on tools and software for sentiment analysis implementation, the students will get first-hand experience in measuring brand perception, consumer satisfaction, and emerging trends in customer sentiment. This unit will highlight how important sentiment analysis is in order to understand market sentiment and adapt marketing strategies accordingly.

- Unit 2.3: 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. Students 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 3: 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

Co-funded by the European Union

studies and best practices, students will be introduced to the challenges and solutions that accompany ethical AI implementation in market research.

- Unit 3.1: Case Studies on Ethical AI Implementation

This unit covers real-life case studies of the ethical issues emerging from the integration of AI in market research. Students will explore scenarios on biassed AI algorithms, transparency over the usage of data, and how this impacts consumer trust at large. In these case studies, students will be shown how to identify the presence of potential ethical risks and evaluate long-term consequences of such issues to consumer relationships and brand reputation. Discussions will focus on the formulation of strategies to ensure that ethical decision making is developed such as, fair and transparent AI mechanisms are in use to allow the continuum of responsible AI as expected by industrial norms and consumer demand.

- Unit 3.2: Privacy and Data Protection in AI Applications

The students will be introduced to the intricacies involved in privacy and data protection in AI-driven market research for this unit. The unit will review the case studies of important cases of privacy breach, and examine the legal and ethical implications that have resulted in these cases on businesses and their customers. Particular attention will be provided to data protection regulation compliance, such as the General Data Protection Regulation, policy, and safeguards necessary for protecting consumer data. Through lessons learned from various industries, students will explore best practices to ensure data privacy, consent, and data security standards in the implementation of AI-driven techniques that enable thorough understanding of responsible data handling while conducting market research.

- Unit 3.3: 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. Students 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**

Recognize and address common ethical concerns in AI, like bias, transparency, and the importance of consumer trust.

2. **Understanding data privacy concerns**

Familiarise with major data protection regulations (e.g., GDPR) and understand how to handle consumer data responsibly.

Co-funded by the European Union

3. **Understanding basic risk management for AI**

Identify and manage potential risks in AI applications, such as data quality issues and biases.

4. **Applying AI to solve market research problems**

Learn how to apply AI techniques to address typical challenges in market research, including improving data quality and overcoming organisational resistance.

Specific competencies

1. **Using selected AI tools in market research**

Gain hands-on experience with AI tools and techniques, like sentiment analysis and predictive modelling, to analyse market data.

2. **Analysing real-world case studies**

Study examples of how companies use AI successfully, learning what works and avoiding common mistakes. Understand rules and structures to ensure AI is used fairly, responsibly, and transparently.

3. **Understanding basic data protection measures**

Develop specific skills in using data protection strategies to keep consumer information safe and compliant with legal standards.

4. **Interpreting data using visualisation**

Create effective visual representations of data findings to enhance stakeholder understanding.

Soft competencies

1. **Communication skills**

Learn how to explain AI's ethical and practical aspects clearly to different people inside or outside organization.

2. **Promoting values of ethical AI usage**

Be prepared to advocate for responsible AI practices within a company, promoting a culture that values ethics and transparency.

3. **Improved adaptability**

Stay flexible and open-minded in the face of challenges with AI, whether technical problems or organisational resistance.

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

Develop the ability to assess and solve ethical and technical issues in AI, thinking creatively about responsible solutions.

Co-funded by the European Union

Intended learning outcomes:

1. **Assess basic concepts of AI relevant for market research**

Students will be able to assess key terminology and methodologies applied in market research using AI, such as algorithms, data analysis, and sentiment analysis.

2. **Evaluate case studies related to the usage of AI for market research**

Students will be able to get into case studies showing how AI is actually applied in the real market research world, and from this, draw out good and bad practices. They will learn how to apply basic AI methods, such as trend analysis and customer segmentation, to interpret market data and predict emerging trends.

3. **Demonstrate awareness of data protection and compliance**

Students will be able to demonstrate an understanding of the basic strategies of compliance necessary to protect consumer information and maintain trust in the activities of market research. This includes knowledge of data privacy principles, which are most important in keeping consumer information safe in AI applications, and acquaintance with crucial regulations such as GDPR.

4. **Communicate ethical and practical aspects of AI**

Students will be able to articulate both the benefits and ethical implications of artificial intelligence in market research to various audiences. They will identify some of the common ethical issues related to AI, including bias and transparency, and describe approaches to addressing these problems responsibly.

5. **Identify challenges in AI-driven research and evaluate strategies for overcoming them**

Students will identify common challenges involved in the deployment of AI in market research, from problems with data quality to resistance in organisations, and will offer practical solutions.

6. **Demonstrate adaptability in learning AI concepts**

Students will develop a flexible mindset, preparing them to adapt to new AI technologies and methods in market research as they evolve.

Learning and teaching methods:

1. **Lectures**. Instructor-led sessions to introduce the key concepts, theories, and methodologies related to AI and market research which will provide a foundation for students.
2. **Interactive workshops**. These will be truly interactive workshops, where students, by the use of AI tools and techniques for sentiment analysis and data visualisation, will be able to engage in real market research scenarios.

Co-funded by the European Union

3. **Case study analysis**. Students will be provided with an opportunity for group discussions and analysis of real case studies that depict the use of AI in market research, and in that way encouraging their critical thinking and practical applications of concepts.
4. **Group projects**. In a team environment, students will be able to develop and carry out AI-driven market research project that will enhance teamwork and problem-solving skills.
5. **Guest lectures**. They will be organised by inviting industry professionals to share their insights and experience on AI in market research. In this way, students will be exposed to the latest trends and practices.
6. **Online discussions**. Online discussion forum will be provided to students where they can engage in course material, share their thoughts and questions about topics related to AI in market research.
7. **Assignments and quizzes**. Regular assignments and quizzes will be designed for students to assess their understanding of the course material, to consolidate learning, and inform students about their performance.
8. **Practical applications**. The course will emphasise practical applications, and the students are encouraged to do individual research on the uses of AI in market research and present their findings to their class peers.

Readings:

Mandatory Readings

1. Siegel, E. *Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die.* Wiley, 2016.
2. Müller, V. C. (Ed.). *Ethics of Artificial Intelligence and Robotics.* Stanford Encyclopaedia of Philosophy, 2020.
3. Paliwal, M. N., and Nishita C. "AI in Market Research: Transformative Customer Insights - A Systematic Review." In *Exploring the Intersection of AI and Human Resources Management*, 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." *International Journal of Intelligent Networks* 3 (2022): 119–132. Link.
5. Ameen, N., Tarhini, A., Reppel, A., and Anand, A. "Customer Experiences in the Age of Artificial Intelligence." *Computers in Human Behavior* 114 (2021): 106548. Link.

Optional Readings

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.

Co-funded by the European Union

5. Harvard Business Review. Link.

Evaluation

Weight (in %)	**Assessment:**
40%	Group Project on AI-Driven Market Research
30%	Individual Written Report on Sentiment Analysis
20%	Quizzes and Participation
10%	Presentation of Case Study Analysis

Co-funded by
the European Union

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

4.9.1 CVET

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**			**ECTS**
								3
Lecturer:								
	Language of the Lectures:	English/ national language						
	Language of the Tutorial:	English/ national language						

Prerequisites:

Co-funded by the European Union

No prerequisites are needed in order to attend the course

Content (Syllabus outline):

The course on the basic level deals with the Artificial Intelligence, by establishing the socio-cultural, political and economic context of information and communication technologies with complex cause and effect associations.

The following modules are especially emphasized:

1. **Introduction to AI in Customer Service**

1.1. Understanding AI in Retail, Why it is important? (CCIS)

Understanding AI in retail is crucial for professionals aiming to improve their practical skills. In this course, participants will learn how to use advanced tools such as machine learning platforms (e.g., TensorFlow or PyTorch) to analyze and understand costumer data and accurately forecast shopping behaviors. They will discover how the use of AI-powered recommendation engines can be leveraged to enhance customer experience personalization through practical exercises. Participants will also gain insights into optimizing inventory management using predictive analytics tools such as IBM Watson and SAP, which help forecast demand and prevent stock shortages. Additionally, they will learn to implement dynamic pricing strategies using AI software like Prisync and Omnia Retail, which adjust prices based on market data and competition. By mastering these practical tools, they will be equipped to respond swiftly to market trends and develop innovative, customer-centric solutions.

1.2. The Role of Chatbots and Virtual Assistants in Customer Engagement (GAIB)

In this unit, the interaction between chatbots and customer engagement will be examined in practice. Chatbots have a significant impact on brands in terms of customer engagement. Customers are satisfied with the quick responses they receive when they convey their questions and complaints through chatbots. Therefore, chatbots need to be created successfully. With the chatbot software to be created in this unit, brands' chatbot usage will be examined throughout the unit. First, a chatbot software will be created in the unit, and then this chatbot will be developed using artificial intelligence. The development of the chatbot will be ensured by conducting various case studies.

1.3. Chatbots in Customer Service (GAIB)

When customers visit a brand's website or communicate via social media, their most important expectation is to receive a quick response. Therefore, when chatbots are designed, they are expected to be able to answer all kinds of questions that may come from customers or direct them to real customer representatives in appropriate situations. In this unit, a previously created chatbot will be developed using artificial intelligence. Customer

Co-funded by the European Union

experience examples from various brands will be collected and the chatbot to be created in the unit will be developed practically.

1.4. Algorithms for personalized recommendations (Solvership)

This unit is focused on the real-world implementation of algorithms for making recommendations in customer service contexts. Learners will be handling key methods such as collaborative filtering, content-based filtering, as well as hybrid models, learning about how each of these methods can be applied in personalizing recommendations on the basis of real customer data. Advanced methods such as matrix factorization as well as deep learning are addressed, with emphasis placed on how such methods can be applied in real-world business contexts. Using real-world scenarios, interactive practice exercises, as well as case studies related to specific industries, learners will be able to implement recommendation systems that drive customer interaction, customer satisfaction, as well as sales increases.

2. Designing AI-Powered Chatbots for Customer Service

2.1. The power of Virtual Assistants in retail (Solvership)

This course is intended to enable professionals to implement AI-driven virtual assistants in customer service within retail settings. Students will how how the software can be utilized for automatizing responses, support personalization and helping customers with tasks such as product search and recommendations. The focus will be on practical implementation, demonstrating how virtual assistants can be incorporated within current retail systems in order to increase customer interaction, enhance shopping experiences, as well as drive sales and loyalty.

Through the use of industry-specific case studies, demonstrations, and guided exercises, students will also learn how virtual assistants can assist retail workers, decrease workload, and optimize processes, leading to quicker and better service delivery. Learners will be able to install and utilize virtual assistant technology in their retail operations at the conclusion of the unit.

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

In this unit, the relationship between customer loyalty and customized data will be discussed in practice. Brands need various data to be able to make special personalizations for their customers. It is very important that this data is stored healthily and is need-oriented. In the unit, brand loyalty and personalization campaigns used by various brands to create customer loyalty will be examined. At the same time, adaptation will be provided with artificial intelligence through a brand that will be created throughout the unit with data collected from other brands. Artificial intelligence will be asked to create an imaginary brand and establish a customer loyalty policy through this brand, and various imaginary case studies will be created based on the results.

Co-funded by the European Union

2.3. Machine Learning for Customer Insights (Solvership)

This session introduces students to the application of machine learning for better understanding and responding to customer behavior in retail. Participants will use machine learning algorithms to analyze customer data, identify trends, predict future buying habits, and make personalized product or service recommendations.

The course focuses on hands-on experience of turning data into practical insights to support better decision-making, offer custom-tailored services and improve customer experiences. Through real-life case studies and examples, learners will see how machine learning can streamline operations, enhance personalization, and contribute to stronger business outcomes.

By the end of the unit, learners will be confident in applying machine learning tools in their own roles—even if they don't come from a technical background.

3. Module C

3.1. AI Performance Metrics in Customer Service (Solvership)

This session introduces learners to key performance metrics used to evaluate how well AI works in customer service. The learners will get to know basic measures, such as response times, customer satisfaction ratings and improvements in efficiency—important indicators.

Through practical examples learners will see how the metrics are collected, what their meaning is and how they can be used to make more effective and helpful AI interactions. The learner will get a clear understanding of why it's important to track AI performance, so they can make ongoing improvements and deliver better customer experiences.

3.2. Future insights on How AI Will Shape Retail Customer Service - (CCIS)

In this course, students will explore the future impact of AI on retail customer service. They will learn how to provide 24/7 real-time support and swiftly resolve customer inquiries through the use of AI-driven chatbots and virtual assistants, such as those powered by platforms like ChatGPT and IBM Watson Assistant. They will learn how to analyze consumer behavior using advanced AI tools (e.g. Adobe Sensei) in order to personalized product recommendations, and implement dynamic pricing strategies tailored to individual shopper preferences. Additionally, they will explore how to facilitate the seamless integration of online and in-store interactions using platforms like Shopify and Adobe Commerce, promoting an efficient and cohesive omnichannel strategy. The course will also cover how AI solutions can enhance customer data analytics, leading to improved inventory management and predictive insights into future market trends. By mastering these tools and strategies, students will be prepared to respond to market shifts and design innovative, customer-focused solutions.

Co-funded by the European Union

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

This unit will showcase real-world examples of how AI applications are transforming the retail shopping experience. It will present case studies of AI-driven technologies that customers frequently interact with while shopping such as the "**Amazon's "Just Walk Out" technology**" and the "**Sephora's Virtual Artist**" . These case studies demonstrate the growing use of AI and will provide tools to encourage others to implement the same actions in order to improve shopping convenience, personalization, and operational efficiency in retail. The presentation of these case studies will offer a comprehensive understanding and specific best practice examples of how AI can be practically applied within the customer service sector. This approach will highlight specific examples and practical applications, allowing for a deeper appreciation of the potential benefits and challenges involved in integrating AI solutions into customer service operations.

Competencies:

General competencies

- Ability to apply digital tools and AI technologies
- Customer-centric solutions that enhance service responsiveness, personalization in retail.
- Understanding the practical impact of AI
- Develop AI-powered solutions to improve personalization and service responsiveness
- Understand the practical impact of AI through metrics and data insights
- Connect AI technologies across digital and in-store customer experiences
- Resolve customer service challenges through applied AI tools
- Analyze benefits and risks of AI use in customer-facing systems
- Design AI systems that integrate with existing retail workflows

Specific competencies

- Data analysis and predictive tools application in customer service
- Proficiency in using AI-driven tools to improve real-time customer service
- Understanding of AI solutions like "Just Walk Out" and "Virtual Artist."
- Create and refine virtual agents
- Use collaborative and content-based filtering in retail settings
- Forecast demand, trends, and behaviors for inventory and pricing strategies
- Personalize marketing campaigns using AI to increase brand engagement

Soft competencies

Co-funded by the European Union

- Understanding and prioritizing customer needs by using AI tools
- Adaptability to technological change
- The capability to assess and analyze complex AI-driven case studies
- Prioritize customer needs using AI personalization
- Adjust quickly to new AI technologies and retail digital transformations
- Break down and evaluate AI-driven case studies and their implications
- Explain technical solutions clearly to diverse audiences
- Work cross-functionally in retail and AI development teams
- React quickly to customer issues using AI tools
- Continuously update skills in the evolving AI and tech landscape
- Recognize ethical implications of AI in customer data and personalization

Intended learning outcomes:

- Explain the socio-economic impact of AI technologies in retail customer service
- Identify key AI tools used in modern customer service systems, including chatbots and recommendation engines
- Implement AI-driven solutions like chatbots and virtual assistants to automate customer support and enhance engagement
- Apply machine learning tools to analyze customer data and predict behavior patterns for decision-making
- Evaluate the effectiveness of AI technologies using performance metrics such as customer satisfaction scores and response times
- Compare various AI recommendation techniques nd their retail applications
- Design an AI-powered customer engagement solution tailored to a specific retail context
- Develop a customer loyalty strategy using AI to personalize communication and services
- Critically analyze real-world AI case studies to assess benefits, limitations, and practical implementation strategies
- Reflect on ethical considerations and data privacy concerns in the deployment of AI in customer interactions

Learning methods:

- Learning & Teaching methods 1

Co-funded by the European Union

- Learning & Teaching methods 2
- Learning & Teaching methods 3
- Learning & Teaching methods 4
- Learning & Teaching methods 5
- Learning & Teaching methods 6
- Learning & Teaching methods 7
- Learning & Teaching methods 8
- ...

Readings:

Mandatory readings

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

Optional readings:

[2] Katja, Hutter, et al. How AI Revolutionizes Innovation management, Perceptions and Implementation Preferences of AIbased Innovators. Technological Forecasting and Social Change 178, 2022.

Evaluation

Weight (in %)	**Assessment:**

4.9.2 IVET

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**

Co-funded by the European Union

IVET	/	2.,3.	4.,6.
Course type			
University / school course code:			

Lectures	**Seminar**	**Tutorial**	**Work**	**Other work**	**Individual work**		**ECTS**
							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):

The course on the basic level deals with the Artificial Intelligence, by establishing the socio-cultural, political and economic context of information and communication technologies with complex cause and effect associations.

1. **Introduction to AI in Customer Service**

    1.1. Understanding AI in Retail, Why is it important?

This unit will explain the role that AI plays in enhancing both the customer experience and operational efficiency within retail. AI enables retailers to manage inventory more effectively by analysing real-time demand, reducing waste, and predicting which products are likely to spoil or go unsold. AI helps personalize the shopping experience

Co-funded by the European Union

through data-driven insights, providing customers with tailored recommendations that align with their preferences. Additionally, it automates key processes like demand forecasting, enabling retailers to save costs, streamline operations, and stay competitive in a fast-evolving market.

1.2. The Role of Chatbots and Virtual Assistants in Customer Engagement

The content of this unit will cover the relationship between chatbots and customer engagement. Chatbots provide a space where customers can ask questions about products or submit complaints while shopping. While customers moving on to the purchasing stage after browsing through the products is considered positive engagement, negative experiences at this stage lead to negative engagement. Therefore, the experience customers have with chatbots can directly affect customer engagement. It is important for chatbots to be well-designed so that customers' questions can be answered quickly or their problems can be solved in the direction they want.

1.3. Chatbots in Customer Service

This unit will address the relationship between chatbots, which are frequently used by brands, improve customer experience, and customer engagement. With the spread of fast consumption habits, the importance of chatbots, which allow customers to get quick answers from the other party while browsing a brand's website, has increased. For this reason, how chatbots can be developed with artificial intelligence will also be addressed in this unit.

1.4. Algorithms for personalized recommendations

Learners are introduced to various algorithms used for creating personalized recommendations within customer service contexts and explore key methods like collaborative filtering, content-based filtering, and hybrid approaches. As the algorithms differ, it should be presented how each one tailors suggestions to meet individual customer needs. Moreover, matrix factorization techniques and the role of deep learning in modern recommendation systems are presented as an advanced recommendation algorithm. Practical examples and case studies highlight how these algorithms enhance customer engagement by providing relevant and timely suggestions.

2. Designing AI-Powered Chatbots for Customer Service

2.1. The power of Virtual Assistants in retail

This unit covers the growing significance of virtual assistants in the retail sector. It will be demonstrated how AI-driven tools provide customer interaction enhancement through automating responses, personalizing support, and assisting with tasks such as product searches and recommendations. Case studies related to the retail industry will provide an insight on how virtual assistants can improve customer engagement, enhance their shopping experience and contribute to higher sales and retention rates. Moreover, the role of virtual assistance in supporting retail staff, streamlining operations, and ensuring more responsive service will be discussed.

2.2. The relation between customer data and personalization

In this unit, concepts such as data, Big Data, personalization, brand loyalty and the relationship between personalization will be discussed. Today, all brands, regardless of their size, need various data information. They store elements such as their customers' consumption habits and consumption preferences in big data and produce solutions for their customers' needs. At the same time, organizations aim to have institutional and comprehensive information about all interactions between themselves and their customers. By using the information to be

Co-funded by the European Union

obtained for customer personalization, they can develop elements such as having a wide customer base and increasing customer loyalty.

2.3. Machine Learning for Customer Insights

This unit introduces the basics of machine learning and its use in analyzing behavior of customers. Participants will learn about algorithms in machine learning and how they work with information about customers in identifying trends, predicting future preference, and suggesting relevant offerings for goods and services. With such information, companies can make informed decisions in a manner to maximize happiness for customers and simplify service offerings. Examples and case studies will illustrate instances of how individualization and efficiency in service is maximized through use of machine learning in retailing.

3. Advanced AI in Customer Service: Personalization and Data-Driven Approaches

3.1. AI Performance Metrics in Customer Service

This unit introduces participants to key performance metrics used to assess AI applications in customer service. Learners will gain an understanding of basic metrics, such as response time, customer satisfaction scores, and efficiency improvements, that indicate how effectively AI tools meet service goals. Through practical examples, participants will explore how these metrics are collected, interpreted, and used to improve AI-driven interactions, ensuring that customer service solutions are responsive and beneficial. This foundational knowledge helps learners appreciate the importance of tracking AI impact in customer service, allowing for continuous improvements and optimized customer experiences.

3.2. Future insights on How AI Will Shape Retail Customer Service

This unit examines the role of AI in shaping the future of retail customer service. It will be demonstrated how utilizing AI-powered technologies, such as chatbots and virtual assistants, results in highly personalized and efficient support through offering round-the-clock assistance and resolving customer inquiries in real time. Moreover, as AI has a crucial role in analyzing consumer behavior, generating tailored product recommendations and implementing dynamic pricing strategies will be discussed, as well as advanced visual search features that allow customers to find products using images, resulting in further enhancement of the shopping experience. Finally, a seamless integration between online and offline shopping channels will be analyzed to show how to create a more efficient and cohesive omnichannel retail experience.

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

This unit will focus on real-world applications of AI in the retail sector and demonstrating how to leverage these technologies for a better shopping experience. Case studies will cover widely used AI-driven innovations, such as Amazon's "Just Walk Out" technology and Sephora's Virtual Artist. These examples illustrate how AI improves convenience, enhances personalization, and streamlines retail operations, reflecting its growing impact on both customer experience and business efficiency.

Competencies:

General competencies

- Basic understanding of AI in retail

Co-funded by the European Union

- Awareness of AI trends in customer service
- Understanding the fundamentals of recommendation systems and their importance in customer service
- Understanding of AI fundamentals and applications in retail
- Ability to identify how virtual assistants enhance customer interactions
- Knowledge of AI driven tools that improve customer experience
- Ability to relate virtual assistant use to broader retail operations
- Familiarity with virtual assistants and AI's impact on retail services
- Ability to evaluate and apply virtual assistant functions to real retail challenges
- Practical skills in deploying AI driven customer service solutions
- Understanding of personalization through virtual assistants to improve customer experience

Specific competencies

- Application of AI for demand forecasting and inventory management
- Understanding of chatbots, virtual assistants, and visual search
- Skill in selecting and implementing suitable recommendation algorithms based on customer service data requirements and goals
- Explaining the function of virtual assistants in retail
- Identifying AI tools commonly used in customer service
- Outlining case studies demonstrating virtual assistant impacts on customer engagement
- Recognizing operational challenges and solutions associated with virtual assistants
- Identifying how machine learning models assist in customer segmentation and personalization
- Explaining fundamental machine learning models and their retail applications
- Recognizing trends in customer behavior through data analysis
- Connecting machine learning insights to improvements in customer engagement

Soft competencies

- Ability to analyze customer needs and recommend suitable approaches
- Learning and applying new algorithms as recommendation techniques evolve
- Clearly explaining technical recommendations and choices to non-technical stakeholders
- Critical thinking in evaluating virtual assistant performance
- Effective communication regarding AI concepts in team settings
- Developing adaptability in integrating virtual assistants into retail
- Maintaining a customer centric focus when applying AI tools

Co-funded by the European Union

- Analytical thinking for assessing customer data
- Communication skills to discuss machine learning outcomes with non-technical team members
- Collaboration with team members to integrate machine learning insights into customer service
- Developing a data focused mindset to apply machine learning insights effectively

Intended learning outcomes:

- Describe the role of AI in retail customer service
- Differentiate between key AI-powered technologies (chatbots, virtual assistants, recommendation systems)
- Demonstrate the use of AI-driven personalization techniques
- Assess the effectiveness of chatbots in customer engagement
- Critically evaluate ethical and legal considerations in AI-driven personalization
- Use machine learning techniques to analyze customer behavior
- Compare and contrast AI-driven customer engagement strategies
- Analyze future trends in AI for customer service
- Develop a strategy for AI-driven omnichannel retail integration

Learning methods:

- Learning & Teaching methods 1 (Assesing....)
- Learning & Teaching methods 2
- Learning & Teaching methods 3
- Learning & Teaching methods 4
- Learning & Teaching methods 5
- Learning & Teaching methods 6
- Learning & Teaching methods 7
- Learning & Teaching methods 8
- ...

Readings:

Co-funded by the European Union

Mandatory readings

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

Optional readings:

[2] Katja, Hutter, et al. How AI Revolutionizes Innovation management, Perceptions and Implementation Preferences of AIbased Innovators. Technological Forecasting and Social Change 178, 2022.

Evaluation

Weight (in %)	**Assessment:**

Co-funded by the European Union

4.10 AI-Driven Inventory and Logistics Automation

4.10.1 CVET

COURSE SYLLABUS			
Course title:	AI-Driven Inventory and Logistics Automation		
Study program and level	**Study field**	**Academic / school year**	**Semester**
CVET	/		

Course type	
University / school course code:	

Lectures	**Seminar**	**Tutorial**	**Work**	**Other work**	**Individual work**		**ECTS**
16		20			48		3

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

Co-funded by the European Union

Content (Syllabus outline):

The course aims to equip learners 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, learners 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**
    - 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. Learners 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.

    - 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 examaned 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.

    - 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, learners 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**
    - Building and using data pipelines in ai-driven inventory systems

Learners 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

Co-funded by the European Union

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. Learners 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. Learners 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. Learners 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

- understanding and application of AI systems in inventory and supply chain management, enabling them to implement and optimize AI tools in professional environments
- ability to make strategic decisions based on AI-driven data analytics, improving inventory forecasting, supply chain efficiency, and business profitability.
- proficiency in working with various AI tools and platforms, including both proprietary and open-source systems, to optimize inventory and logistics processes.
- Ability to manage and integrate data pipelines, ensuring accurate and efficient data flow for AI-driven inventory management systems.

Co-funded by the European Union

- ability to oversee the integration of AI technologies into supply chain operations and guide teams in adopting and using these tools effectively.
- ability to stay updated on the latest AI advancements, fostering a culture of continuous improvement and innovation within their organizations.

- **Specific competencies**
- integrating advanced AI systems into existing inventory and logistics operations, customizing solutions to meet specific business needs
- ability to design, train, and implement machine learning models to optimize stock levels, predict demand, and manage supply chain variability
- ability to build and manage complex data pipelines that feed accurate and real-time data into AI-driven inventory management systems
- ability to use AI tools for strategic forecasting, optimizing inventory levels, and improving decision-making based on predictive analytics and real-time data
- ability to implement AI-driven optimizations in various aspects of the supply chain, such as route optimization, procurement efficiency, and real-time tracking
- ability to apply AI tools to enhance digital security and manage risks in retail transactions, detecting fraud, and ensuring data protection in inventory and logistics operations
- competency to lead teams through AI-driven changes in inventory and supply chain processes, ensuring smooth adoption and integration of new technologies
- ability to analyze and apply best practices from real-world case studies of successful AI implementations, drawing insights to improve their own organizational strategies

Soft competencies

- leadership skills that enable them to lead teams through the adoption and integration of AI systems, effectively managing change within the organization.
- Ability to think strategically, using AI data insights to make informed decisions that optimize inventory management and supply chain processes.
- ability to collaborate with diverse teams and communicate complex AI-driven insights clearly to both technical and non-technical stakeholders
- build resilience and flexibility in dealing with challenges such as AI system integration, data management issues, or supply chain disruptions, adapting quickly to changing circumstances.
- critical problem-solving skills, enabling them to troubleshoot and resolve complex inventory and logistics challenges using AI systems.
- proactive attitude toward continuous improvement, constantly seeking innovative AI-based solutions to enhance supply chain efficiency and business performance.

Co-funded by
the European Union

- understanding of ethical issues related to AI implementation, including data privacy, transparency, and the responsible use of AI tools in inventory management.
- ability to mentor colleagues and share their knowledge of AI tools and techniques, promoting a culture of learning and innovation within the organization.

Intended learning outcomes:

- Apply AI-driven analytics and automation to optimize inventory and logistics in the wholesale and retail trade.
- Assess and implement AI-driven inventory optimization techniques to enhance stock accuracy, logistics efficiency, and cost reduction.
- Apply machine learning algorithms and advanced analytics to interpret sales data, forecast demand trends, and optimize inventory in real-time to improve operational efficiency
- Implement AI-powered machine learning models to analyze sales data, predict demand trends, and optimize real-time inventory management.
- Design and manage efficient, scalable data pipelines to integrate and process diverse sales, supplier, and market data for AI-driven decision support systems
- Critically compare AI tools and software for inventory management, assessing factors like scalability, customization, proprietary vendor systems, and open-source solutions in professional environments
- Utilize AI-driven predictive models to mitigate supply chain disruptions, optimize logistics operations, and enhance real-time decision-making.
- Evaluate the application of AI to detect fraudulent activities in logistics and sales data, developing strategies to prevent fraud through anomaly detection and continuous monitoring
- Critically assess real-world examples of cutting-edge AI implementation in retail and wholesale supply chains, with a focus on measurable improvements in cost-efficiency, service levels, and long-term strategic outcomes

Learning and teaching methods:

The course can include the following learning and teaching methods:

- Problem-Based Learning (PBL); In this pedagogical model, learners 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 learners 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.

Co-funded by the European Union

- Case Study Analysis; This involves a thorough examination of real-world case studies showcasing successful AI implementations within inventory and logistics frameworks. Learners 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 learners' knowledge base.
- Collaborative Projects with Cross-Functional Teams; In this collaborative format, learners 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 learners 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 learners to practice overcoming integration challenges while working with both proprietary and open-source systems.
- Reflective Practice and Continuous Feedback; Learners 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.

Co-funded by the European Union

- 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

4.10.2 IVET

COURSE SYLLABUS

Co-funded by the European Union

Course title:	AI-Driven Inventory and Logistics Automation

Study program and level	Study field	Academic / school year	Semester
IVET	/		

Course type	

University / school course code:	

Lectures	Seminar	Tutorial	Work	Other work	Individual work		ECTS
30		40			70		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 is designed to provide participants with the key skills needed to utilize AI systems for automating inventory and logistics processes in the wholesale and retail trade sector. By emphasizing machine learning, data pipeline development, and supply chain optimization, participants will gain insights into how AI can enhance

Co-funded by the European Union

operational efficiency, improve stock management, and aid in fraud detection. This approach is tailored to meet the industry's demands in wholesale and retail, concentrating on practical applications of AI in inventory and logistics.

The following modules and units are especially emphasized:

- **Module 1: Introduction to AI Systems in Inventory Management**
    - Unit 1: Understanding AI and its role in supply chain operations

This unit offers an overview of key concepts in Artificial Intelligence (AI) and its impact on improving supply chain operations. Participants will investigate how AI enhances decision-making, speeds up processes, and increases efficiency in areas like inventory management, logistics, and purchasing. The module also covers various AI technologies, such as machine learning and automation, explaining how these tools contribute to the effectiveness of supply chains and help reduce costs.

- Unit 2: AI Systems for Inventory Forecasting

The lesson explores the role of AI in predicting inventory requirements and managing stock levels. Participants will learn how AI utilizes historical data and market trends to anticipate demand, avoid shortages, and minimize overstocking. This unit details how AI models function to optimize inventory, ensuring that businesses have the right products on hand when needed.

- Unit 3: Practical applications of AI in wholesale and retail trade

The practical applications of AI in the wholesale and retail sectors are addressed. By examining real-life examples and case studies, participants will gain insight into how AI systems facilitate functions such as product recommendations, automated inventory management, dynamic pricing, and customer behavior analysis. This unit underscores how AI enhances operational efficiency and drives profitability within these industries.

- **Module 2: Implementing AI tools for inventory management**
    - Unit 4: Building and using data pipelines in AI-driven inventory systems

An overview of creating and overseeing data pipelines crucial for AI-driven inventory systems is given. Processes of gathering, processing, and merging data from diverse sources such as sales reports and market trends, used to fuel AI models, are presented. The unit emphasizes the significance of precise and timely data in ensuring the optimal functioning of AI systems are introduced to participants.

- Unit 5: Machine learning models for stock optimization

Participants will explore the application of machine learning models in optimizing stock levels. This unit addresses fundamental techniques such as classification and regression, illustrating how these models can forecast the timing and quantity of stock orders. Participants will explore how machine learning contributes to preventing stock shortages, reducing surplus inventory, and cutting costs in inventory management.

- Unit 6: Integration of AI tools with proprietary and open-source inventory systems

Co-funded by the European Union

Possibilities on integrating AI tools with custom-built and open-source inventory systems are explained. It covers technical aspects of incorporating AI algorithms into existing software and addressing common challenges. Participants will expand their skills in optimizing the compatibility of AI with current inventory systems to enhance overall efficiency.

- **Module 3: Enhancing supply chain visibility and efficiency with AI Systems**
    - Unit 7: AI-Driven supply chain optimization

Participants will investigate how AI can improve supply chain operations, leading to faster and more efficient processes. This unit discusses different AI tools that help in making informed decisions about transportation, warehousing, and procurement. Participants will observe how AI plays a role in demand forecasting, optimizing routes, and reducing delays in the supply chain, which ultimately enhances performance and saves costs.

    - Unit 8: Digital security and transaction analysis in the retail sector

The role of AI in protecting digital transactions in the retail sector will be explored. Participants will be shown how AI systems scrutinize transaction data to detect fraudulent activities, ensure secure payments, and protect sensitive information. This unit also covers key cybersecurity practices designed to strengthen retail systems against cyber threats

    - Unit 9: Case studies in AI-enabled supply chain success

Participants will explore real-world examples that highlight the transformative effects of AI on supply chains. They will analyze case studies from different industries that illustrate how AI-driven systems have increased visibility, reduced costs, and boosted overall supply chain efficiency. Participants will also gain valuable insights into effective strategies and best practices for integrating AI into supply chains

Competencies:

General competencies

- understanding of Artificial Intelligence (AI) and its applications in inventory management and logistics, allowing them to grasp key terms and principles
- ability to analyze problems related to supply chain management and inventory control, using AI tools to propose solutions.
- Digital literacy: Participants will acquire basic digital skills necessary to work with AI-powered inventory management systems, including data input, basic analysis, and system navigation.
- ability to effectively communicate and collaborate in team settings, working together to implement AI systems in practical, supply chain-related tasks.
- adaptability emerging AI tools and technologies, preparing them to work in environments that continuously evolve with digital advancements.
- interpreting data outputs from AI systems, allowing them to make informed decisions regarding inventory levels and logistics operations.

Co-funded by the European Union

Specific competencies

- applying fundamental AI concepts to simple inventory management tasks, such as tracking stock levels and predicting basic demand using AI tools
- understanding of how machine learning models function in inventory optimization, including how they predict stock needs and minimize waste
- ability to collect and input data into AI systems and interpret simple outputs, supporting basic inventory forecasting and replenishment strategies
- using AI-based decision-support tools to assist in routine tasks such as stock ordering, inventory tracking, and supply chain management
- ability to operate entry-level AI software or platforms, understanding the interface and basic functions to manage inventory data and logistics
- identifying areas where AI can enhance supply chain operations, such as improving inventory accuracy or automating simple logistic tasks

Soft competencies

- ability to adapt to new technologies, especially AI systems, as they become more integrated into supply chain and inventory management processes
- ability to think critically and solve basic problems that arise in inventory management and logistics using AI tools and data insights
- effectively communicating and the ability to work collaboratively within teams to implement AI-driven solutions in inventory management tasks
- enhancing the attention to detail by working with data inputs and outputs in AI systems, ensuring accuracy in inventory forecasts and stock management
- fostering a mindset of curiosity, staying open to learning more about AI technologies and how they can be applied in different aspects of the supply chain
- developing basic time management skills, ensuring they can handle tasks such as monitoring stock levels or updating AI systems promptly and efficiently
- ability to take initiative in identifying areas where AI can streamline operations and suggest improvements in everyday processes

Intended learning outcomes:

- Explain basic AI concepts and their relevance to inventory and logistics in the wholesale and retail trade
- Analyze real-world applications of AI for inventory management optimization, including predictive stocking and automation in logistics
- Apply machine learning algorithms to analyze sales data and forecast demand in real-time for optimal stock levels

Co-funded by the European Union

- Demonstrate the process of creating efficient data pipelines to feed AI systems with sales, supplier, and market data
- Compare and contrast different AI tools and software for inventory management, including proprietary vendor systems and open-source options
- Evaluate the use of AI to detect fraudulent transactions by identifying anomalies in sales and logistics data

Learning and teaching methods:

The course can include the following learning and teaching methods:

- Demonstrations and practical workshops: engaging hands-on workshops where participants can interact with essential AI tools and platforms. Demonstrations highlight real-time applications of ai in inventory management, such as tracking stock levels and basic forecasting techniques.
- Interactive simulations: utilizing digital simulations allows participants to experience Ai-driven inventory management in a controlled environment, where they can apply fundamental concepts and make decisions based on simulated data.
- Guided group projects: participants collaborate on small projects that involve using ai to tackle simple supply chain or inventory challenges, promoting teamwork and practical problem-solving skills.
- Step-by-step tutorials: well-organized tutorials that guide participants through the process of using ai tools, from data input to interpreting results. These tutorials focus on basic tasks like managing inventory data within ai systems.
- Case-based learning: presenting clear, real-world case studies that demonstrate how ai is applied in inventory and logistics, followed by discussions and activities where participants analyze the efficiency improvements brought about by ai.
- Gamified learning modules: incorporating gamification elements, such as quizzes, challenges, and badges, to make learning about AI and inventory management both engaging and motivating for participants.
- Peer learning and collaboration: encouraging interaction among peers, allowing participants to share insights, assist each other with tasks, and collaboratively address problems related to AI in supply chains.
- Mentored assignments: providing participants with practical assignments under the guidance of an instructor or mentor, where they apply AI tools to real-world inventory scenarios and receive constructive feedback for improvement.

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.

Co-funded by the European Union

- 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

Co-funded by the European Union