ARTIFICIAL INTELLIGENCE (EMaCS-02-05)				
DEGREE PROGRAM:	Master in Computer Science for the Human-Centric and Sustainable Industry			
SEMESTER: Second	**TYPE:** Elective	**CREDITS:** 5 ECTS	**WORKLOAD:** 125 hours	**MENTORING:** 1 hours/week
LANGUAGE: English				

OBJECTIVES	
General	The general objective of this module is to provide students with a comprehensive and practical understanding of Artificial Intelligence principles, applications, and ethical considerations in contemporary computer science.
Specific	• Intelligent and cognitive agents • Planning, decision-making, and acting • Game theory • Learning • Cognitive models and perception • Multi-agent simulation • Digital twins • AI and robotics • Ethical considerations

SUSTAINABILITY
The Artificial Intelligence (AI) course significantly contributes to sustainability by providing students with comprehensive knowledge and practical skills in AI principles and applications. Through an emphasis on ethical considerations, the course ensures that students are well-versed in the responsible development and deployment of AI technologies. By delving into diverse domains such as machine learning, robotics, and natural language processing, students are equipped to apply AI techniques to address real-world challenges. The cultivation of a critical and analytical mindset fosters an awareness of the limitations and potential biases in AI models, contributing to the creation of fair and transparent AI solutions. Emphasizing multidisciplinary approaches and ethical responsibilities, the course prepares students to develop sustainable AI applications that prioritize societal impact and environmental considerations.

RESILIENCE AND HUMAN-CENTRIC DEVELOPMENT
The AI course plays a pivotal role in fostering resilience and human-centric development by empowering students with advanced skills in solving complex real-world problems. Through a focus on planning, decision-making, and acting, students learn to design and implement custom AI algorithms tailored to specific application scenarios. The inclusion of ethical considerations underscores the importance of prioritizing human well-being and societal impact in AI projects. Proficiency in AI development tools and programming languages, combined with practical experience in handling large-scale datasets, prepares students to contribute to the resilience of organizations and communities. The proactive attitude towards continuous learning ensures that students remain adaptable and innovative in addressing evolving challenges in the dynamic field of Artificial Intelligence.

SUBJECT MATTER
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COMPETENCES
C6. USING MACHINE LEARNING AND A.I. TECHNIQUES   C7. PROTECTING PERSONAL DATA AND PRIVACY   C8. PROTECTING HEALTH AND WELL-BEING   C9. REFLECTING ON ETHICAL OUTCOMES   C10. EXPLORATORY AND CRITICAL THINKING   C14. SOLVING TECHNICAL PROBLEMS   C16. WORKING WITH OTHERS

LEARNING OUTCOMES

Knowledge	- Know about the underlying principles, algorithms, and methodologies of Artificial Intelligence (AI) across various domains, including machine learning, natural language processing, computer vision, robotics, and more. - Know about the theoretical foundations of AI, such as mathematical concepts, statistical methods, optimization techniques, and knowledge representation.
Skills	- Develop advanced skills in applying AI techniques to solve complex real-world problems, including data pre-processing, feature engineering, and model selection and evaluation. - Gain proficiency in programming languages and tools commonly used in AI development, such as Python, TensorFlow, PyTorch, and other AI frameworks. - Acquire the ability to design and implement custom AI algorithms and adapt existing ones to specific application scenarios. - Develop practical experience in handling large-scale datasets and deploying AI models in real-world environments.
Attitudes/values	- Cultivate a critical and analytical mindset, capable of questioning AI models, evaluating their limitations, and interpreting the results with a cautious perspective. - Recognize the ethical responsibilities associated with AI development and usage, prioritizing fairness, transparency, and societal impact in AI projects. - Value collaboration and teamwork, understanding the importance of multidisciplinary approaches in solving complex AI challenges. - Embrace a proactive attitude towards continuous learning and professional development, keeping abreast of the latest AI advancements and best practices throughout their careers.

TEACHING METHODS

- Seminar-style teaching methods: Work in small groups, board work, multimedia presentations, voluntary exercise tasks, academic work with publications, application-oriented work using online materials and current tools.
- Practical work: Task processing in small groups with a concluding acceptance discussion, presentations, and written assignments.

EVALUATION

- Regular examination format: Graded written exam.
- Alternative examination formats: Graded oral examination or graded presentation.

In cases where multiple examination formats are possible for the module, the responsible lecturer will announce the required format at the beginning of the course.

Prerequisite (PVL): Successful completion of the exercise tasks.

PRECONDITIONS

None

DEPARTMENT	Computer Science
LECTURERS	Thomas Clemen Jan Sudeikat: https://www.researchgate.net/profile/Jan-Sudeikat Martin Hübner: https://users.informatik.haw-hamburg.de/~huebner/

LITERATURE	- ACM Transactions on
	   o Interactive Intelligent Systems (TiiS)
	   o Intelligent Systems and Technology (TIST)
	   o Applied Perception (TAP)
	   o Human-Robot Interaction (THRI)
	   o Computational Logic (TOCL)
	   o Autonomous and Adaptive Systems (TAAS)
	   o Modelling and Computer Simulation (TOMACS)
	   o Journal of Artificial Intelligence (AIJ)

	• S. Russell, P. Norvig, Artificial Intelligence: A Modern Approach, Global Edition, 2016 • State of the art scientific papers