

PREDICTIVE ANALYTICS AND DECISION SUPPORT (EMaCS-02-06)				
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 objectives of the module are to equip students with the knowledge, skills, and tools to utilize data-driven techniques, statistical models, and machine learning algorithms to make informed predictions, gain valuable insights from data, and support decision-making processes in various domains. The module aims to provide students with a comprehensive understanding of predictive analytics methodologies, data exploration, model development, and evaluation, enabling them to apply these techniques to solve real-world problems and assist in making data-driven decisions effectively and ethically.
Specific	<ul style="list-style-type: none"> • Decision Making • Data-Driven Decision Support • Quantifying Uncertainty • Probabilistic Reasoning • Selected topics from the field of Deep Learning • Further topics based on current relevance
SUSTAINABILITY	
The Predictive Analytics and Decision Support course significantly contributes to sustainability by empowering students with the knowledge and skills needed to apply data-driven techniques, statistical models, and machine learning algorithms for informed predictions and decision-making. Through a comprehensive exploration of predictive analytics methodologies, the course ensures students are equipped to tackle real-world problems effectively and ethically. By emphasizing principles of fairness and transparency, students learn to prioritize ethical considerations in utilizing data-driven decision support techniques. The proactive and problem-solving attitude cultivated in students prepares them to address sustainability challenges through innovative and data-driven solutions. The incorporation of probabilistic reasoning and deep learning applications further enhances students' capabilities, fostering a resilient approach to decision-making in dynamic and uncertain environments.	
RESILIENCE AND HUMAN-CENTRIC DEVELOPMENT	
The Predictive Analytics and Decision Support course plays a crucial role in fostering resilience and human-centric development by providing students with skills to quantify uncertainty and develop robust decision-making strategies. Through an emphasis on data-driven decision support, students gain proficiency in articulating complex problems and developing models to solve them. The course instills a critical and open-minded approach to uncertainty, enabling students to navigate ambiguity in decision-making processes. By addressing selected topics in deep learning and staying updated with current relevance, students remain adaptable to emerging challenges. The focus on ethical considerations ensures that students prioritize human well-being and societal impact in their decision support models, contributing to resilient and human-centric development.	
SUBJECT MATTER	
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COMPETENCES	
C3. MANAGING AND EVALUATING DATA, INFORMATION AND DIGITAL CONTENT C4. INTEGRATING AND RE-ELABORATING INFORMATION and DIGITAL CONTENT C5. PROGRAMMING C11. PROBLEM FRAMING C14. SOLVING TECHNICAL PROBLEMS C16. WORKING WITH OTHERS C17. COMMUNICATING EFFECTIVELY	

LEARNING OUTCOMES	
Knowledge	<ul style="list-style-type: none"> • Know about the principles, methodologies, and techniques used in predictive analytics, decision support, and quantifying uncertainty. • Know about various data-driven decision-making approaches, including probabilistic reasoning and deep learning applications. • Know about current and relevant topics in the field of predictive analytics and decision support.
Skills	<ul style="list-style-type: none"> • Develop the skills to identify and articulate complex practical problems related to predictive analytics and decision support effectively. • Gain proficiency in developing suitable models and utilizing selected applications to solve real-world problems and make data-driven decisions. • Acquire the ability to evaluate the results of predictive analytics and decision support models and draw meaningful insights from the outcomes.
Attitudes/values	<ul style="list-style-type: none"> • Cultivate a proactive and problem-solving attitude, embracing the challenges of complex problem-solving in predictive analytics and decision support. • Recognize the importance of ethical considerations in using data-driven decision support and predictive analytics techniques, prioritizing fairness and transparency. • Value continuous learning and staying updated with the latest advancements in predictive analytics and data-driven decision-making approaches. • Foster an open-minded and critical approach when dealing with uncertainty and ambiguity in decision-making processes, understanding the value of probabilistic reasoning.
TEACHING METHODS	
<ul style="list-style-type: none"> • 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	
<ul style="list-style-type: none"> • Regular examination format: Graded written exam. • Alternative examination formats: Graded oral examination or graded presentation. <p>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.</p> <p>Prerequisite (PVL): Successful completion of the exercise tasks.</p>	
PRECONDITIONS	
None	
DEPARTMENT	Computer Science
LECTURERS	Marina Tropmann-Frick Thomas Clemen
LITERATURE	<ul style="list-style-type: none"> • Russell, S., Norvig, P. Artificial Intelligence: A Modern Approach. Prentice Hall • Sharda, R.; Delen, D.; Turban, E. Analytics, Data Science, & Artificial Intelligence: Systems for Decision Support, Prentice Hall, NJ. • Sabherwal, R., and Becerra-Fernandez, I. Business Intelligence: Practices, technologies and management, John Wiley & Sons, NY. • State of the art scientific papers