# Course Title: Cognitive Robotics in the Age of AI: Shaping a Sustainable Future with Intelligent Machines

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| **Course form** | Workshop – Cognitive Robotics |
| **Study type** | Undergraduate (Bachelor level) |
| **Module responsible** | Prof. Dr. Jürgen Graf, j.graf@hochschule-trier.de |
| **Language** | English |
| **Turnus** | On request |
| **Recommended pre-requisites** | English level B2 |
| **Coursedescription** | Areas of expertise<br>- Building professional competence through hands-on robotics activities that reveal how SDGs 2, 3, 9, 11 and 12 are inter-connected, and why systems thinking in cognitive robotics is crucial for sustainable progress.<br>- Strengthening methodological competence by consistently embedding sustainability considerations into the design, implementation and assessment of cognitive robotics solutions addressing these SDG goals.<br>Learning outcomes<br>Participants will understand how cognitive robotics and computer vision contribute to SDG 2, 3, 9, 11 and 12, and be able to map concrete robotic applications to these goals. They will design and prototype small-scale robotics solutions that address sustainability and societal challenges. By the end, they can clearly argue the SDG impact of their own robotics projects.<br>Content<br>1. Theory<br>- Introduction to the SDG system<br>- (Varied) global approaches to sustainability<br>- Cognitive Robots in the age of AI with respective SDG goals (a prioritized top-five selection):<br>• SDG 9 – Industry, Innovation and Infrastructure: Core robotics & CV R&D for advanced manufacturing, automation, and smart infrastructure.<br>• SDG 11 – Sustainable Cities and Communities: Robot perception and autonomy for urban mobility, smart cities, and disaster response.<br>• SDG 2 – Zero Hunger: Agri-robotics and vision-based crop monitoring for sustainable, efficient food production.<br>• SDG 12 – Responsible Consumption and Production: Vision-guided inspection, sorting, and maintenance to reduce waste and resource use.<br>• SDG 3 – Good Health and Well-Being: Medical imaging, surgical and assistive robots using CV to improve diagnosis and care.<br>2. Cognitive Robotics Workshop - Teamwork makes the dream |

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| | work challenge! |
| **Assessment type** | Study assignment and practical work using Jupyter Notebooks. |
| **Credit hours** | 2 |
| **Credits** | 2 |
| **Literature** | Course material:<br><br>J. Graf, Cognitive Systems (Introduction to Sensors, Perception, AI, Navigation, and Control), 2025<br><br>J. Graf, Cognitive Vision Systems (Computer Vision using Deep Learning), 2025<br><br>J. Graf, Visual Navigation (Visual Odometry and visual aided Navigation), 2025 |