Master Thesis Topic
We offer the following Master thesis topic:

"Goal Reasoning and Action Planning under Dynamics and Uncertainty"

Exogenous changes, sensing information and human-robot interaction turn plan generation and execution for autonomous intelligent agents into inherently dynamic and recurring tasks. First of all, multiple and sometimes conflicting goals need to be prioritized, where the success chances of plans for achieving the goals need to be taken into account. Moreover, plans may be based on sensing information, where the information acquisition and predictive evaluation of possible outcomes must be incorporated into the planning process. In multi-agent decision making, which particularly includes human-robot collaboration, reasoning about the capabilities, knowledge and goals of other agents is important to coordinate joint operations. Last but not least, real-world scenarios are subject to exogenous and often unpredictable changes in the environment; e.g., autonomous vehicles must constantly monitor the traffic to take safe actions.

In the light of these challenges, the goal of the Master thesis is to develop a demonstrator for dynamic goal reasoning and action planning in a selected application scenario from the robotics domain. The Master thesis will be co-supervised by members of the Department of Artificial Intelligence and Cybersecurity at the University of Klagenfurt and the JOANNEUM RESEARCH Robotics Institute at the Lakeside Science & Technology Park. This collaboration offers a unique opportunity to showcase Artificial Intelligence methods for planning and optimization in a practically relevant robotics environment, set up in simulation or even physically.

The following are some (incomprehensive) literature references, which can be consulted as a starting point for getting better intuition of the Master thesis topic and relevant research targets:

- *M. Rizwan, V. Patoglu, E. Erdem. Human Robot Collaborative Assembly Planning: An Answer Set Programming Approach. Theory and Practice of Logic Programming, 20(6): 1006-1020, 2020. https://arxiv.org/abs/2008.03496*
- *B. Schäpers, T. Niemueller, G. Lakemeyer, M. Gebser, T. Schaub. ASP-Based Time-Bounded Planning for Logistics Robots. International Conference on Automated Planning and Scheduling, 2018. https://www.aaai.org/ocs/index.php/ICAPS/ICAPS18/paper/download/17777/16944*
- *P. Mazdin, M. Barcis, H. Hellwagner, B. Rinner: Distributed Task Assignment in Multi-Robot Systems based on Information Utility. International Conference on Automation Science and Engineering, 2020. https://ieeexplore.ieee.org/document/9216982*
- *B. Reiterer, M. Hofbaur. Opportunistic Planning with Recovery for Robot Safety. German Conference on Artificial Intelligence, 2017. https://link.springer.com/chapter/10.1007/978-3-319-67190-1_31*

The Master thesis topic is suitable for students of Applied Informatics, Artificial Intelligence and Cybersecurity, Information Technology or Information Management. For further information, please contact **Univ.-Prof. Dr. Martin Gebser** (Martin.Gebser@aau.at), research group for Production Systems.