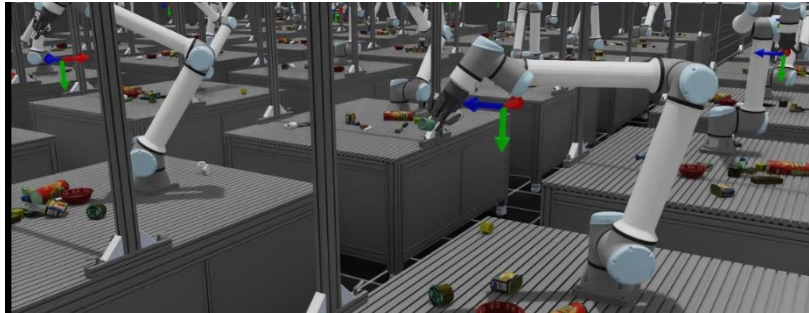


Master's Thesis (m/w/d)

"Selective Replay for Enhancing Sample Efficiency and Resource Optimization in Lifelong Robot Learning"



Problem formulation

In autonomous lifelong learning, robots must continuously adapt to new tasks and environments without forgetting previously acquired knowledge. This capability is crucial for robots operating in dynamic, real-world scenarios, where they face an ongoing stream of diverse experiences. However, traditional reinforcement learning (RL) and machine learning algorithms often require vast amounts of data and computational resources to maintain performance, making them inefficient for lifelong learning. This challenge is exacerbated by the problem of catastrophic forgetting, where newly learned information can overwrite or degrade previously acquired knowledge.

One promising approach to address these challenges is selective replay, a technique where the robot selectively revisits past experiences to reinforce learning and retain critical knowledge. Selective replay aims to improve sample complexity—reducing the number of samples required to learn effectively—and minimize the resources and computation needed for continuous online learning.

Task definition

This master thesis will explore the development and implementation of selective replay strategies aimed at optimizing sample complexity and minimizing resource usage in lifelong robot learning. The research will involve designing algorithms that can intelligently manage and utilize replayed experiences to enhance learning efficiency and robustness. The algorithms will be developed in simulation with the potential to test them on real robotic systems.

You shall offer

- Solid knowledge base and experience in deep learning and robotics.
- Coding skills in Python

We will offer

- The chance to contribute to the cutting-edge research of the DFG-CRC project of the circular factory
- The most state-of-the-art technologies in deep learning and computer vision.

Research area:
AI & Robotics

Focus:

- Experimental
- Theoretical
- Practical
- Simulation
- Construction (CAD)

Study program:

- Maschinenbau
- Mechatronik
- Elektrotechnik
- Informatik
- Informationswirtschaft
- Wirtschaftsingenieurwesen

Begin: From now on

If you are interested, please send us an e-mail with your **curriculum vitae** and a current **transcript of records**.

Contact person:

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Please note that your data will be treated in accordance with the applicable data protection regulations as part of the application process.