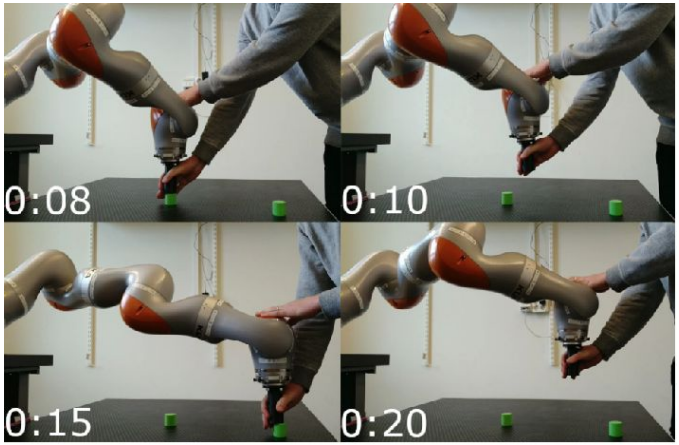
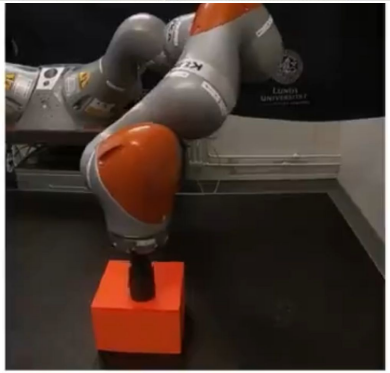
RL Projects at the Robotlab

1. Learning Imitation of Demonstrated Behaviors with RL
2. Learning Tasks with Dual-Arm Coordination
3. Safe Learning of Robot Behaviors with Black-box policies (neural nets)
4. Knowledge-supported reasoning for RL scenarios

Learning Imitation of Demonstrated Behaviors with RL

- Demonstrate behaviors rather than programming it
- Lower entry hurdle to robot usage
- Just re-executing it does not necessarily give **good** and **robust performance**





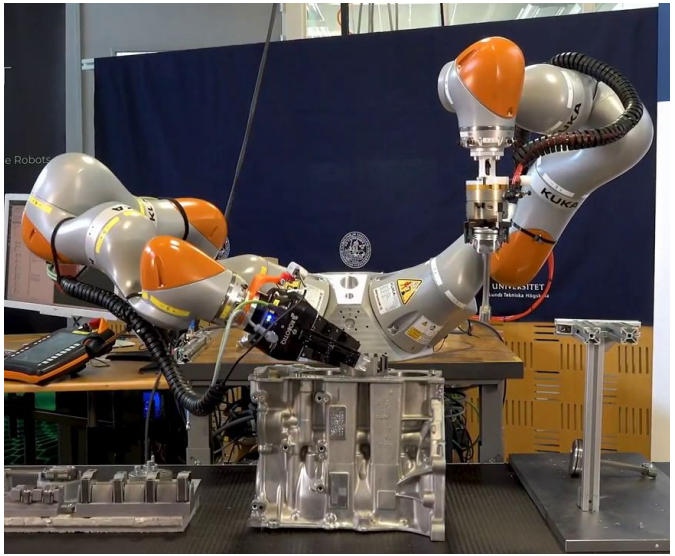
Goal: Demonstrate behaviors and use RL to learn reliable parameters

Supervisor: Matthias Mayr (matthias.mayr@cs.lth.se)

Learning Tasks with Dual-arm Coordination

- Dual-arm tasks require special coordination and control
- Industry requires interpretable behaviors
- RL to learn the coordination for a **robust** and **collision-free**

Goal: Use RL to learn dual-arm behaviors that minimize execution time and fulfill safety guarantees



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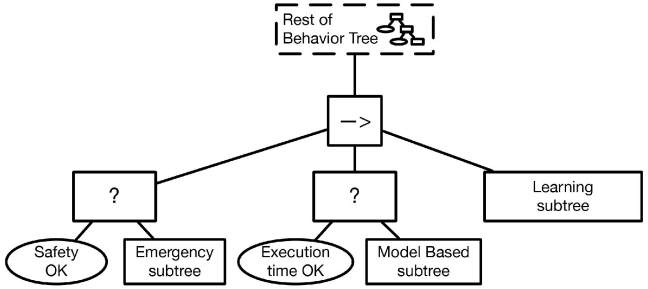
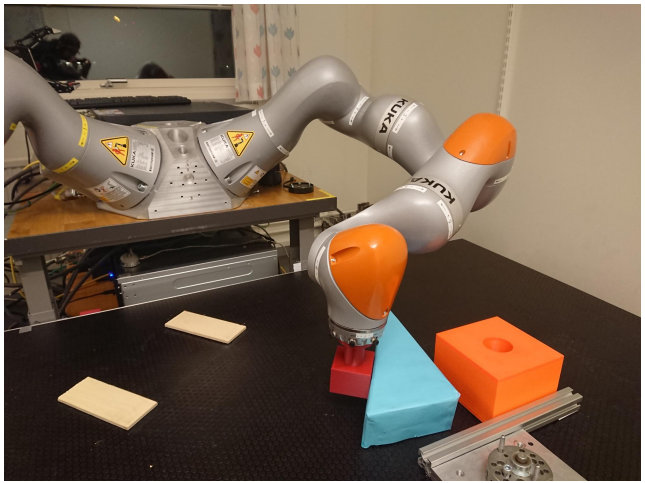
Safety Constraints for Reinforcement Learning (RL)

- RL can be dangerous for
  - The robot itself
  - Tools and the environment
- Safety rules can be formulated and checked
  - Avoidance of areas
  - Maximum forces
- Allows to learn non-interpretable policies





Goal: Learn black-box policies (neural networks) for manipulation tasks in simulation and on a real robot

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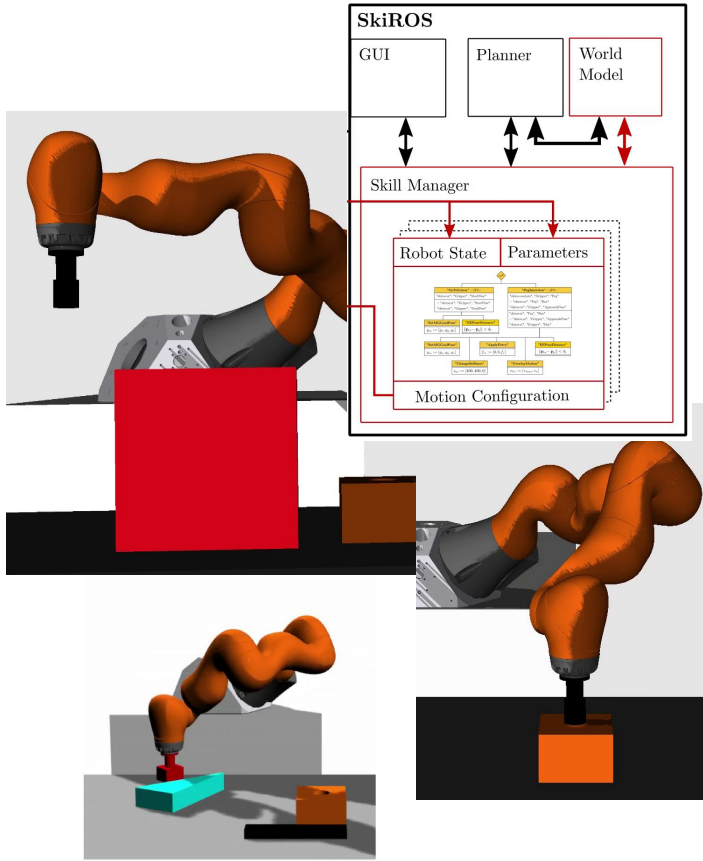
Knowledge-supported reasoning for RL scenarios

- *Hybrid approaches of data-driven methods + traditional AI techniques*
- We can use planning to solve tasks
- Some tasks need learning through RL
  - Create RL scenarios

Goal: Explore the world model and use reasoning to automatically create RL scenarios



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