



QUANTAO YANG received his BSc degree (2012) in Communication Engineering from Shandong University in China and his MSc degree (2015) in Information and Automation Engineering from University of Bremen in Germany. He has been a doctoral student with the Center of Applied Autonomous Sensor Systems (AASS) at Örebro University in Sweden since 2019. During spring 2023 he spent a period of five months as a visiting researcher with the Robot Perception and Learning lab at UT Austin, USA. His research interests lie in machine learning and robotics. In particular, He is interested in improving robot manipulation performance with reinforcement learning and imitation learning.

A critical challenge in the field of robotics is enabling robots to acquire and refine skills efficiently, allowing them to adapt and excel in diverse environments. This thesis investigates the questions of how to acquire robot skills through prior-conditioned machine learning and adapt these learned skills to novel environments safely and efficiently. The thesis leverages the synergy between Reinforcement Learning (RL) and prior knowledge to facilitate skill acquisition in robots. It integrates existing task constraints, domain knowledge and contextual information into the learning process to benefit the acquisition of new skills. The core idea behind our method is to exploit structured priors derived from both expert demonstrations and domain-specific information which guide the RL process to effectively explore and exploit the state-action space. This thesis specifically focuses on ensuring safe interactions, training the policy on the robot directly, generalizing across tasks and environments, and facilitating skill transfer across different robots.

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