

Topic	Deep Learning based Robotic Teleoperation
Abstract 	<p>One common way of teaching skills to robots is to guide the robot by holding its hand and demonstrating a task (kinesthetic teaching). One way to alleviate the need for teaching different robots individually is by using teleoperation. Typically, human demonstrations can be captured by skeleton tracking with VR or motion capture, which requires special hardware. Can the use of simple videos combined with deep learning and AI achieve similar results which can be generalized?</p>
Language	English
Exemplary Issues	<p>The key goals of this thesis are:</p> <ul style="list-style-type: none"> • Investigating existing methods for teleoperation, such as skeleton tracking, incorporation of VR etc, either by using similarities between the robot joints and a human or by mimicking the motions of the hand. • Extending existing works with Deep Learning based skeleton & hand tracking and evaluate their accuracy. • Exploring the efficiency of using such methods to learn directly from internet videos of tasks.
Key References	<p>[1] Fritsche, L., Unverzag, F., Peters, J. and Calandra, R., 2015. First-person tele-operation of a humanoid robot. In IEEE-RAS International Conference on Humanoid Robots (Humanoids).</p> <p>[2] Zhang, T., McCarthy, Z., Jow, O., Lee, D., Chen, X., Goldberg, K., and Abbeel, P., 2018. Deep imitation learning for complex manipulation tasks from virtual reality teleoperation. In IEEE International Conference on Robotics and Automation (ICRA).</p> <p>[3] Prasad, V., Stock-Homburg, R., and Peters, J., 2021. Learning Human-like Hand Reaching for Human-Robot Handshaking. To appear in IEEE International Conference on Robotics and Automation (ICRA).</p>
Additional Information	<p>Start: as soon as possible</p> <p>Kind of thesis: Master/Bachelor thesis or Studienarbeit</p> <p>Requirements: Programming knowledge (Python/C++), Knowledge of AI or Machine Learning or Deep Learning.</p> <p>Publication options: High quality work would be submitted to international conferences.</p>
Contact	<p>The exact focus can be determined individually with the supervisors. The work is supervised by Prof. Dr. Dr. Ruth Stock-Homburg, Prof.</p>

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