

Master/Bachelor Thesis

Imitation Learning via Demonstration

Background

Deep reinforcement learning (RL) has recently been very successful at learning complex behaviors. But it requires a lot of interactions with the environment to learn a new task. This makes it difficult to apply it to real-world robotic tasks. Meta-reinforcement learning (meta-RL) aims to learn an efficient RL algorithm that can quickly learn a new task. However, in meta-RL the new task is communicated to the agent only with rewards. We think it might be advantageous to give the agent some additional information about the task. In this work, you will demonstrate that meta-reinforcement learning can be improved by inserting task instructions directly into the observations of the agent, which has been done before. You will demonstrate the effectiveness of your work with one of the two kinds of task instructions: language instructions and task demonstrations. You will evaluate the algorithm on the challenging Meta-World benchmarks [1] for robotic manipulation tasks.

Your Tasks

In this thesis, you will develop imitation-RL algorithms that try to solve tasks in dynamic environment, where the demonstration can be semantic instructions or expert policies. To be specific:

1. You will learn knowledge about RL and imitation learning.
2. You will work on the basis of our current algorithm and further improve the algorithm or develop a novel algorithm.



Figure 1 Meta-world benchmark [3].

Requirement

- High self-motivation and passion on research.
- Six month working time.
- Existing knowledge about RL will be a bonus

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[1] [Concept2Robot: Learning Manipulation Concepts from Instructions and Human Demonstrations](#). In: Robotics: Science and Systems (RSS).

[2] [Watch, Try, Learn: Meta-Learning from Demonstrations and Reward](#). In: arXiv:1906.03352.

[3] [Meta-world: A benchmark and evaluation for multi-task and meta reinforcement learning](#). Conference on Robot Learning. PMLR, 2020.