Karlsruhe Institute of Technology

Autonome Lernende Roboter (ALR)

Prof. Gerhard Neumann

Project Type

- ☑ Master Thesis
- ☑ Bachelor Thesis
- ☑ Research Project

Supervisors

Jeyhoon Maskani

jeyhoon.maskani@uni-tuebingen.de

Difficulty

Algorithmic

Math

Application

Benchmarking Model-Based RL Algorithms

Description

Research in model-based RL has not been very standardized. It is fairly common for authors to experiment with self-designed environments, and there are several separate lines of research, which are sometimes closed-sourced or not reproducible. Accordingly, it is an open question how these various existing MBRL algorithms perform relative to each other. To facilitate research in MBRL, there is already a work that gathers a wide collection of MBRL algorithms and propose over 18 benchmarking environments specially designed for MBRL [4]. The algorithms were benchmarked with unified problem settings, including noisy environments.

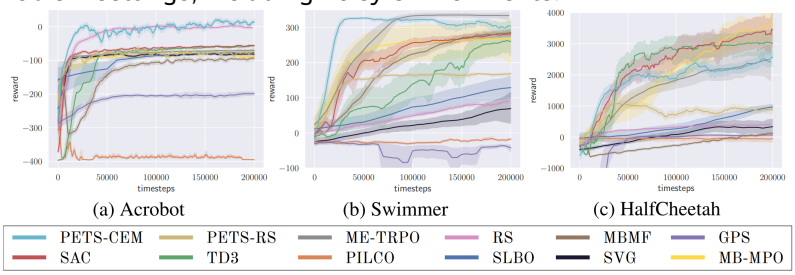

Figure 1: A subset of performance figures of the bench-marked algorithms [4].

In this project, we want to extend this benchmark by adding some of the newly introduced algorithms (such as PDDM [3], MBPO [2], Dreamer [1]) to help improving the community's understanding about these algorithms. There is also a possibility to apply these algorithms to peg-insertion task using our simulation framework and also on the real robot.

Tasks

The tasks in this project will involve:

- Identifying Potential Algorithms for Benchmarking: It helps to get in touch with the authors of the original work and the benchmarking repository to avoid duplicated works.
- Standardized Implementation: Standardize the implementation w.r.t. Benchmarking MBRL [4] guidelines and add your contribution.
- Potential Improvements: Investigate different aspects of the algorithm for improvement (e.g.: better planner, learning a better representation, etc.)
- Adapting to Peg-Insertion Task (Optional): Adapt the implementation to the new task and investigate the sensitivity of the final performance w.r.t. the different aspect of the algorithm.

References

[1] Danijar Hafner, Timothy Lillicrap Deepmind, Jimmy Ba, Mohammad Norouzi, and Google Brain. Dream to Control: Learning Behaviors by Latent Imagination. *ICLR 2020*.

[2] Michael Janner, Justin Fu, Marvin Zhang, and Sergey Levine. When to Trust Your Model: Model-Based Policy Optimization. jun 2019.

[3] Anusha Nagabandi, Kurt Konoglie, Sergey Levine, and Vikash Kumar. Deep Dynamics Models for Learning Dexterous Manipulation. sep 2019.

[4] Tingwu Wang, Xuchan Bao, Ignasi Clavera, Jerrick Hoang, Yeming Wen, Eric Langlois, Shunshi Zhang, Guodong Zhang, Pieter Abbeel, and Jimmy Ba. Benchmarking Model-Based Reinforcement Learning. *CoRR*, abs/1907.02057, 2019.