

## Project Type \_\_\_\_\_

- Master Thesis
- Bachelor Thesis
- Research Project

## Supervisors \_\_\_\_\_

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## Difficulty \_\_\_\_\_

Algorithmic

Math

Application

# Adaptive Replanning in Reinforcement Learning

## Description

Recent RL methods [2, 1] generate chunks of multiple consecutive action to increase sample efficiency and overall performance. Currently these chunks get executed in an open-loop manner. This has two disadvantages: Firstly, when unexpected events happen (like an object slipping out of the robots gripper), the agent can only react after the chunk was fully executed. Secondly, some tasks like locomotion are inherently difficult to solve with (long) action chunks and require careful tuning of the chunk size to learn useful behaviour at all.

The goal of this thesis is to adapt an action chunking RL method to dynamically decide when to continue executing the current chunk and when to replan.

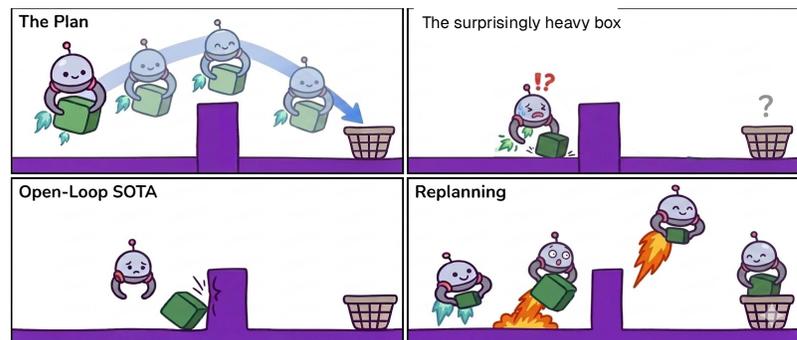


Figure 1: Illustration of dynamic Replanning in reaction to system stochasticity (eg box weight). Made with Gemini.

## Tasks

The tasks in this project will involve:

- Getting familiar with the base algorithm You will choose or design a suitable task to test your replanning method. You will use an existing SEAR [2] algorithm to train chunking, non-replanning policies as a baseline.
- Literature Research To identify promising approaches for replanning, you will conduct a literature research of applicable methods from hierarchical RL, Imitation Learning, model-based RL and other RL approaches.
- Implementation You will implement one or more methods for adaptive replanning based on the existing code base.
- Evaluation You will analyze the method both quantitatively using bench mark tasks as well as qualitatively: Why does the method work? When does it learn to replan, when does it fail to do so?

## Outlook

Action chunking in RL is a hot topic right now and your method could enable a leap in capability — this opens up the possibility of publishing your results as a paper.

## References

- [1] Qiyang Li, Zhiyuan Zhou, and Sergey Levine. Reinforcement learning with action chunking. In *The Thirty-ninth Annual Conference on Neural Information Processing Systems*, 2025.
- [2] C. F. Maximilian Nagy, Onur Celik, Emilian Gospodinov, Florian Seligmann, Weiran Liao, Aryan Kaushik, and Gerhard Neumann. Sear: Sample efficient action chunking reinforcement learning, 2026.