

## Offline Reinforcement Learning based on Robotics Scenarios

### Research Internship + Master Thesis (2 offers)

#### Research Description

Traditionally, reinforcement learning (RL) is designed to solve online tasks for the interaction between the RL agents and environment can be considered to improve the task solving successful rate. However, it is often expensive (time-cost and device running) to implement online learning based on RL structure, besides, it may result in dangerous statuses (both human and machine) when collecting data in real world.

Offline RL (ORL) considers less interaction between agents and environments based on the loaded expert data. Further, the advantage of the fixed dataset can also be the real-world data. Thus, the gap between simulation and real-world can be eliminated ideally. While the lack of the environment interaction can also lead to extrapolation error (an error in policy evaluation). Then the agent may learn the policy in wrong way when preferring out-of-distribution (OOD) actions. Several solutions are proposed to solve that problem. The main idea of them is to constrain the learned policy close to the data distribution. Thus, several algorithms are proposed such as CQL, Fisher-BRC, TD3+BC, SAC-N, AWAC etc. Also, many researchers also focus on generating good and representative data to improve agent training. How to improve the training efficiency becomes our concern.

To address that, possible topics within the scope of the offered internship + thesis can be:

- How can we generate suitable dataset to accelerate training of the ORL?
- ORL benchmark testing based on D4RL and Mobile Robot setups.
- Improve agent training with different techniques.

#### Prerequisites:

- Master-level studies in computer science or relevant majors.
- Excellent Python programming skills.
- Ability to work well structured and organized.
- Strong background about reinforcement learning (previous relevant project is a plus).

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