Artificial Intelligence Project Proposal

Hierarchical Reinforcement Learning for Sparse Rewards

1 Problem

Sparse reward is a fundamental challenging problem for RL. Hierarchical exploration approaches learns to select subgoals and how to achieve subgoals, which seems helpful for reinforcement learning with sparse rewards. There are several papers show that hierarchical exploration allows more quickly to explore regions far away than basic ϵ-greedy exploration.

Some problems are remained. For example, why hierarchical exploration performs better than ϵ-greedy exploration? Is there any other exploration method performing better?

2 Existing Works

[1]
[5]
[4]
Something may be not so related:
[3]
[2]

3 Limitation

4 Goal

We hope to achieve one or more goals below.

- Design a hierarchical exploration algorithm which performs good under specific environment.

- Improve hierarchical exploration algorithm mentions in papers.
- Explain why hierarchical exploration performs better than ϵ-greedy exploration.
- Design a learning algorithm in environments with sparse feedbacks, which performs better than hierarchical exploration.

References

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[5] Alexander Sasha Vezhnevets, Simon Osindero, Tom Schaul, Nicolas Heess, Max Jaderberg, David Silver, and Koray Kavukcuoglu. Feudal networks for hierarchical reinforcement learning. In *Proceedings of the 34th International Conference on Machine Learning, ICML 2017, Sydney, NSW, Australia, 6-11 August 2017*, pages 3540–3549, 2017. URL http://proceedings.mlr.press/v70/vezhnevets17a.html.