Reward Hacking Mitigation

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Abstract

Choosing good reward functions in reinforcement learning (RL) is notoriously difficult. Oftentimes, the true reward function is very sparse, as in a game of chess that gives a reward signal only when the agent wins. In other scenarios, such as preference optimization for large language models (LLMs) using algorithms like reinforcement learning from human feedback (RLHF) [**?**], the true reward function—alignment to human preferences—is impossible to specify. As a result, RL techniques typically employ proxy rewards, which provide finer-grained feedback loops and are easier to learn. However, these proxy rewards can be misspecified; RL agents that exploit misspecifications in the proxy reward function can exhibit undesirable and potentially harmful behaviors. According to **?**], this type of behavior—where an agent attains a high proxy reward but does not accomplish the human-intended goal—is referred to as *reward hacking*. In this work, we investigate the problem of reward hacking and propose a novel approach that improves the approximation of the true reward function by incorporating feedback from Vision-Language Models (VLMs) into the training loss.

1 Introduction

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2 Background

Example citations [1] [2] [3]

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References

[1] Dario Amodei, Chris Olah, Jacob Steinhardt, Paul Christiano, John Schulman, and Dan Mané. Concrete problems in ai safety. *arXiv preprint arXiv:1606.06565*, 2016.

[2] Alexander Pan, Kush Bhatia, and Jacob Steinhardt. The effects of reward misspecification: Mapping and mitigating misaligned models, 2022.

[3] Joar Skalse, Nikolaus H. R. Howe, Dmitrii Krasheninnikov, and David Krueger. Defining and characterizing reward hacking, 2022.

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