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Organisationseinheit verbal
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RLHF using natural language feedback.

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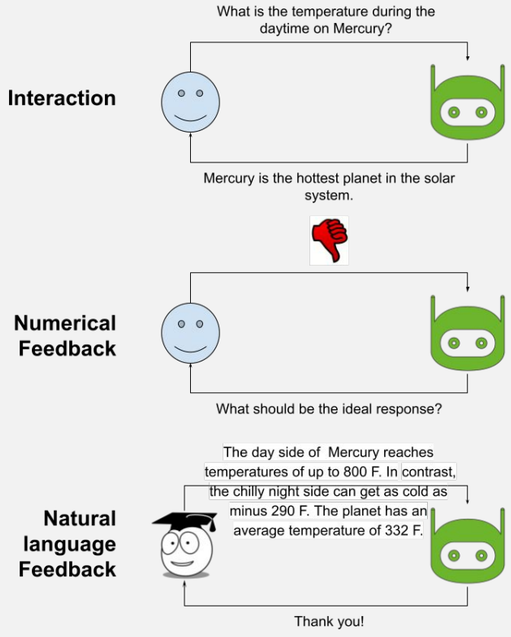
1 Introduction

Reinforcement learning from human feedback(RLHF) has proven beneficial in aligning language models[1], however, majority of these approaches rely on numerical feedback[2]. RLHF using natural language feedback remains largely unexplored[2]. We propose two techniques to factor in natural language feedback alongside numerical feedback.

2 Problem Overview

After deployment, the BOT can gather human feedback from the user in the following manner[4]:



3 Methods

1. Joint loss function

1.1 Policy gradient objective[3]:

$$J_{\mathrm{PG}}(\pi_\theta) = \mathbb{E}_{\tau\sim\rho_{\pi_\theta}}\left[\sum_{t=0}^{T-1}\gamma^t\cdot\hat{Q}_t\log\pi_\theta(a_t|s_t)\right],$$

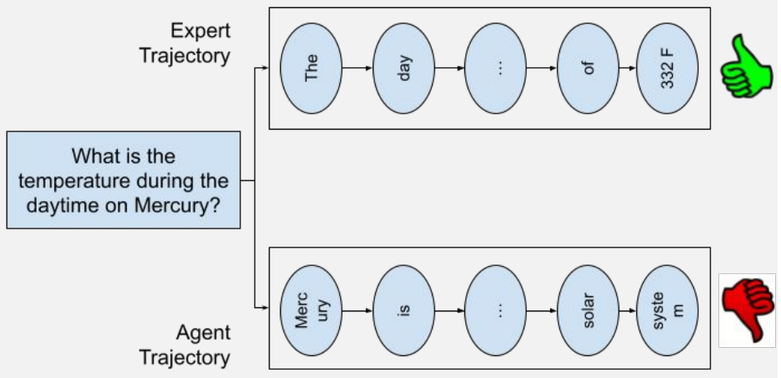
1.2 Interactive Imitation learning objective[2]:

$$J_{\mathrm{IL}}(\pi_\theta) = E_{s\sim d^{\pi_E},a\sim\pi_E(.|s)}[\log(\frac{\pi_E(a|s)}{\pi_\theta(a|s)})]$$

1.3 Joint objective:

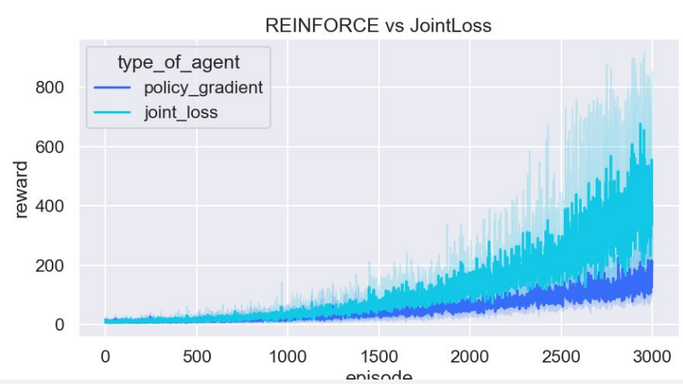
$$J(\pi_\theta) = \alpha J_{\mathrm{PG}}(\pi_\theta) + (1-\alpha)J_{\mathrm{IL}}(\pi_\theta)$$

2. Expert trajectory injection



4 Experiment setup and Results

- The proposed approaches are compared against REINFORCE algorithm(policy_gradient).
- Metric of comparison is cumulative reward after n episodes.
- The environment used for comparison is Mujoco's InvertedPendulum-v4. We will move to real world environment proposed in fits[4] once we get positive results in Mujoco.



References

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[4] Jing Xu Learning new skills after deployment: Improving open-domain internet-driven dialogue with human feedback, 2022.

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