Revisiting Rainbow: Promoting more insightful and inclusive deep reinforcement learning research

Johan S. Obando Ceron, Pablo Samuel Castro*

*Google Research, Brain Team

LXAI

Overview:

Motivation: We argue for a need to change the status-quo in evaluating and proposing new research to avoid exacerbating the barriers to entry for newcomers from underprivileged communities.

- We complement this argument by revisiting the Rainbow algorithm on a set of small- and medium-sized tasks.
- This work allows to conduct a counterfactual analysis, and investigate whether there is scientific value in exploring empirical research in reinforcement learning when restricting oneself to small- to mid-scale environments.
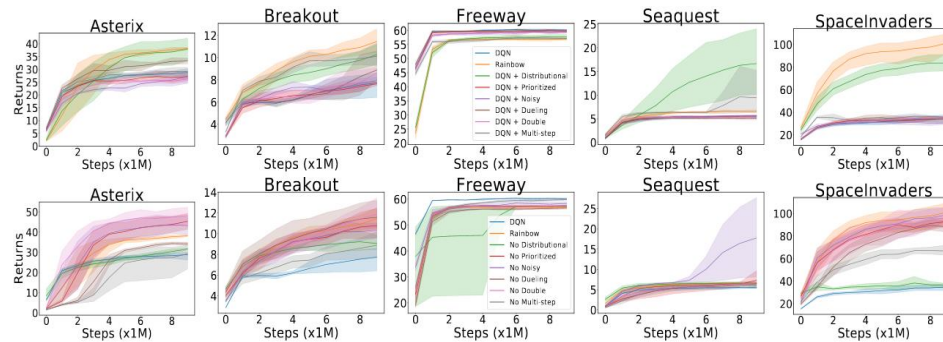
Environments [1, 2]:
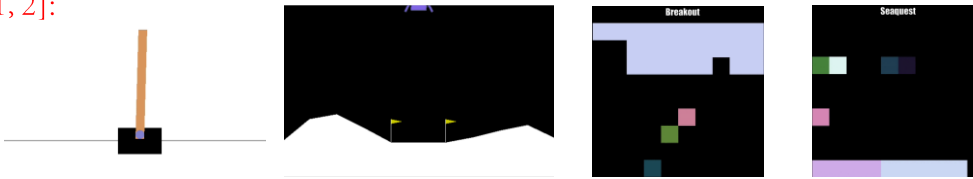
Results:

Fig.1. Comparison of the different algorithmic components on five MinAtar games, using the optimal hyper-parameters for each. Top row explores adding on top of DQN, bottom row explores removing from Rainbow.
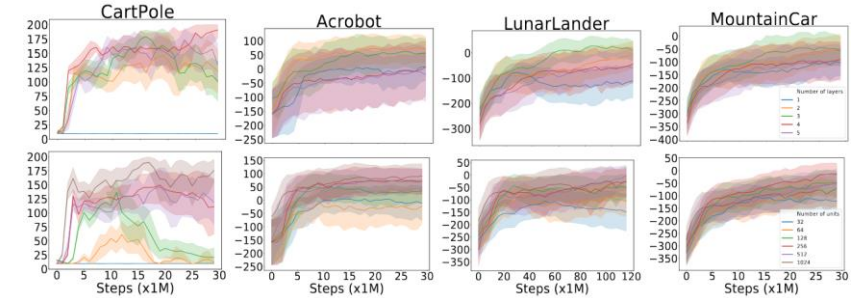

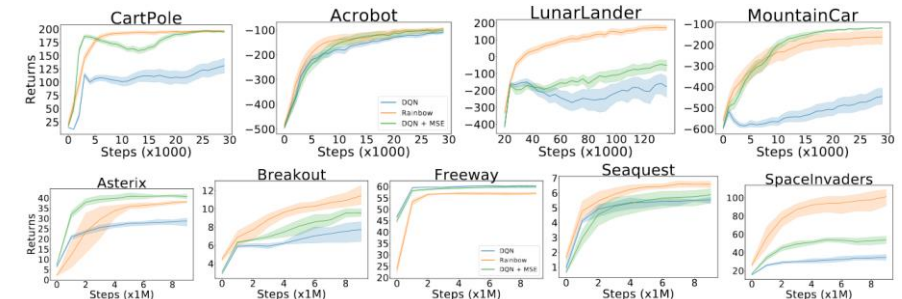**Fig.2.** Evaluating DQN sensitivity to varying number of layers (top) and units per layer (bottom).

Fig.3. Evaluation of the use of the mean-squared error loss, instead of the Huber loss, in DQN.
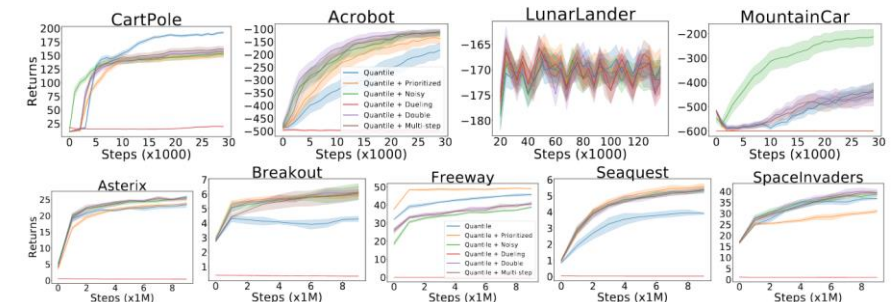

Fig.4. Investigating the combination of the different algorithmic components with QR-DQN.

References:
1. Greg Brockman, Vicki Cheung, Ludwig Pettersson, Jonas Schneider, John Schulman, Jie Tang, and Wojciech Zaremba. Openai gym, 2016.
2. Kenny Young and Tian Tian. Minatar: An atari-inspired testbed for thorough and reproducible reinforcement learning experiments.arXiv preprint arXiv:1903.03176, 2019.