Making Reinforcement Learning Experiments more Reproducible and Computationally Efficient

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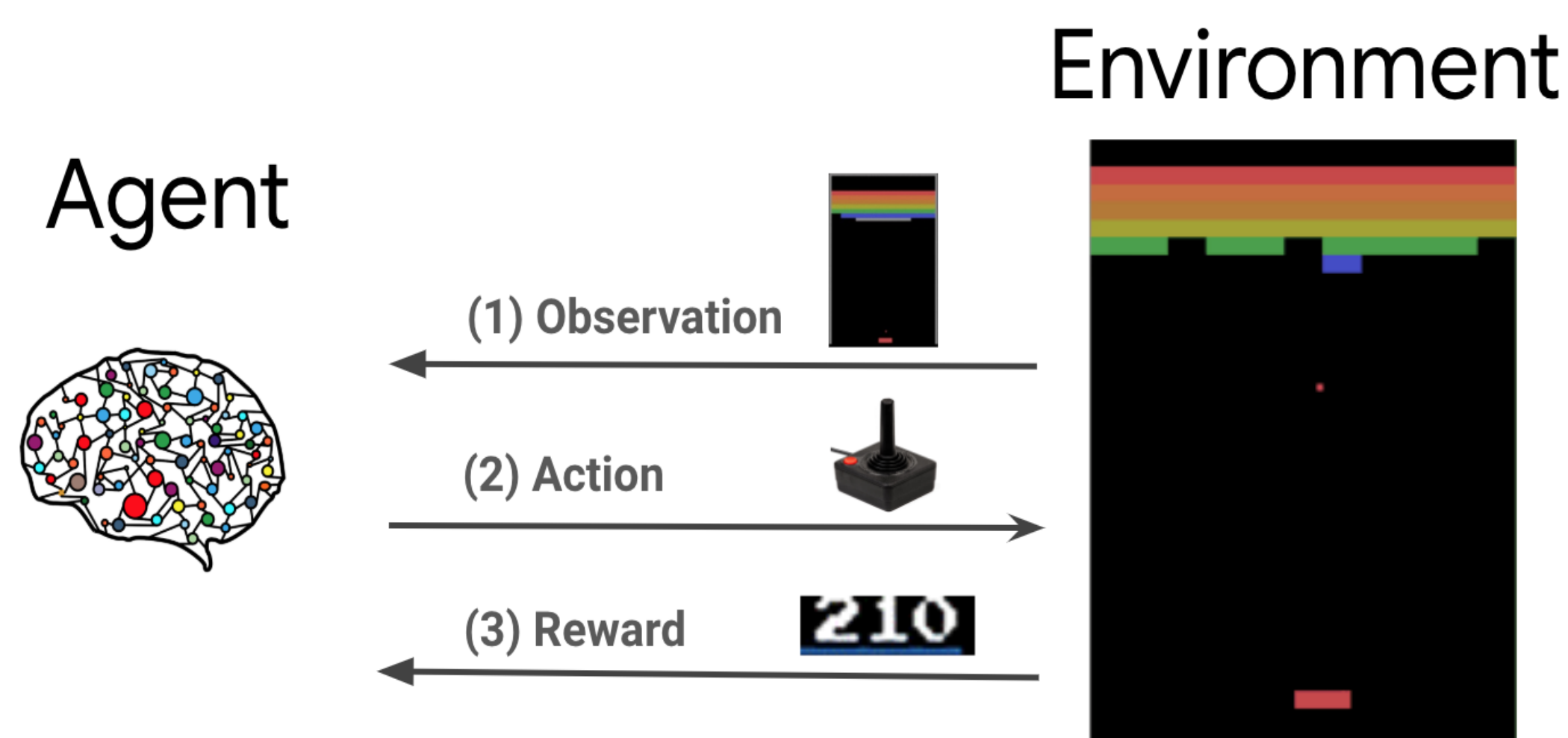{rjoseph1, whitem, amw8, sfneuman}@ualberta.ca

MinAtar

➤ MinAtar, introduced by researchers at the University of Alberta, Google Brain and Deepmind simplified 5 games representational complexity to focus more on the behavioral challenges.


Overview

➤ Current implementation of these games are slow hence we optimized and refactored the whole codebase by reducing the overall training time.
➤ We also propose a new hyperparameter approach that computes N average returns for each hyper-setting and records the highest average performance. We then proceed to perform additional K runs with different seeds on these best hyper-settings and then construct and report the mean learning curves
➤ Testbed for researchers to test their Reinforcement Learning and Artificial Intelligence agents.

Environments

➤ Five Atari games which play out on a 10x10 grid. State representation is 10x10xn where each of the n channels correspond to a game-specific object.

Asterix   *Freeway*   *Space Invaders*   *Seaquest*
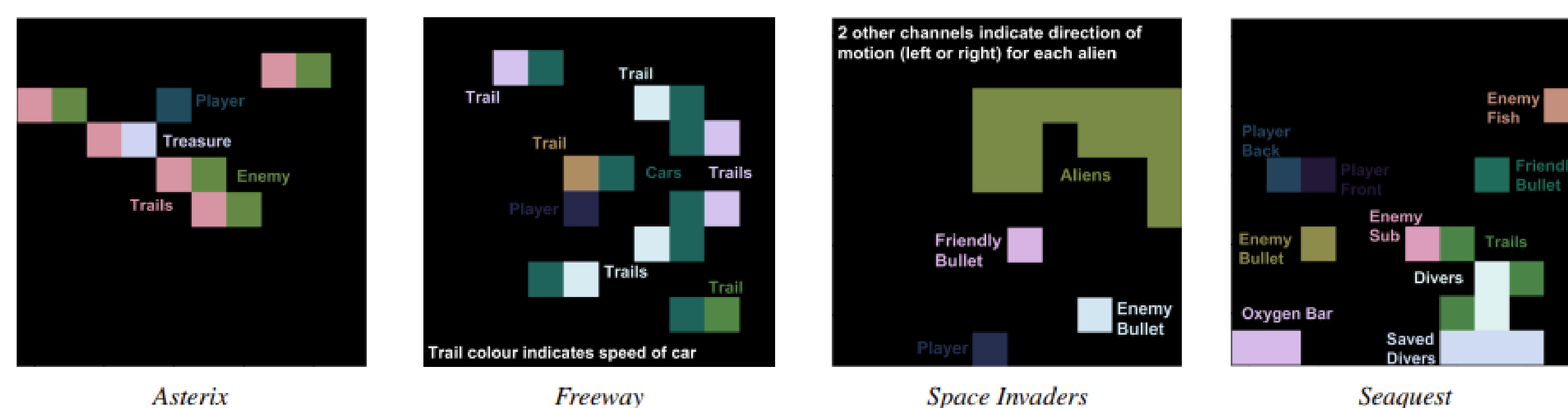
Results

➤ Environments were trained on the Soft Actor Critic agent.
➤ Fixed hyperparameter setting – Chosen randomly.
➤ 1.5 Million frames and 2500 steps per episode.
➤ Added Just in Time Compilation (JIT) too for the Python implementation using Numba.
➤ Added more agents to the codebase such as Vanilla Actor Critic (VAC), Deep Q-network (DQN), SAC etc.
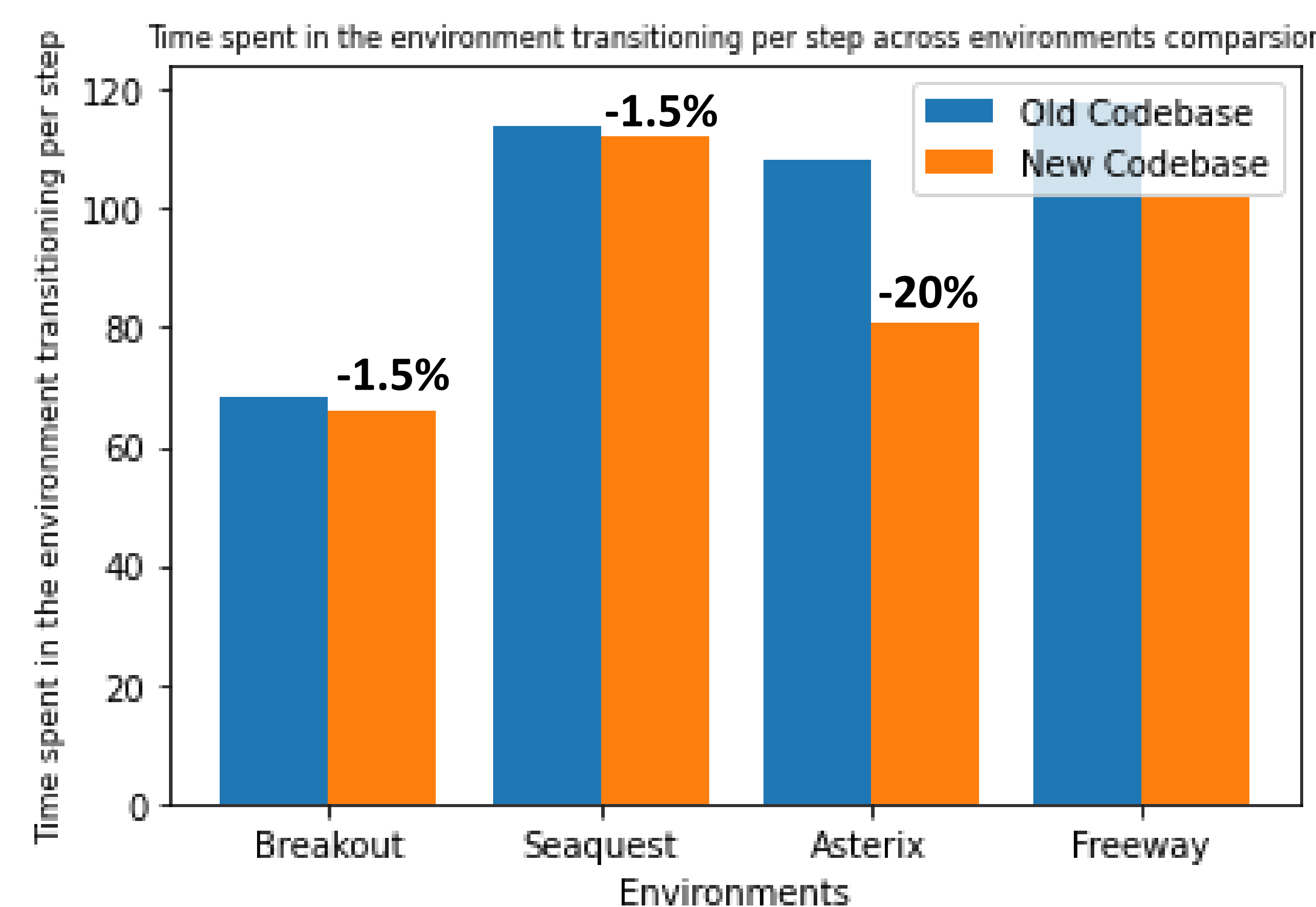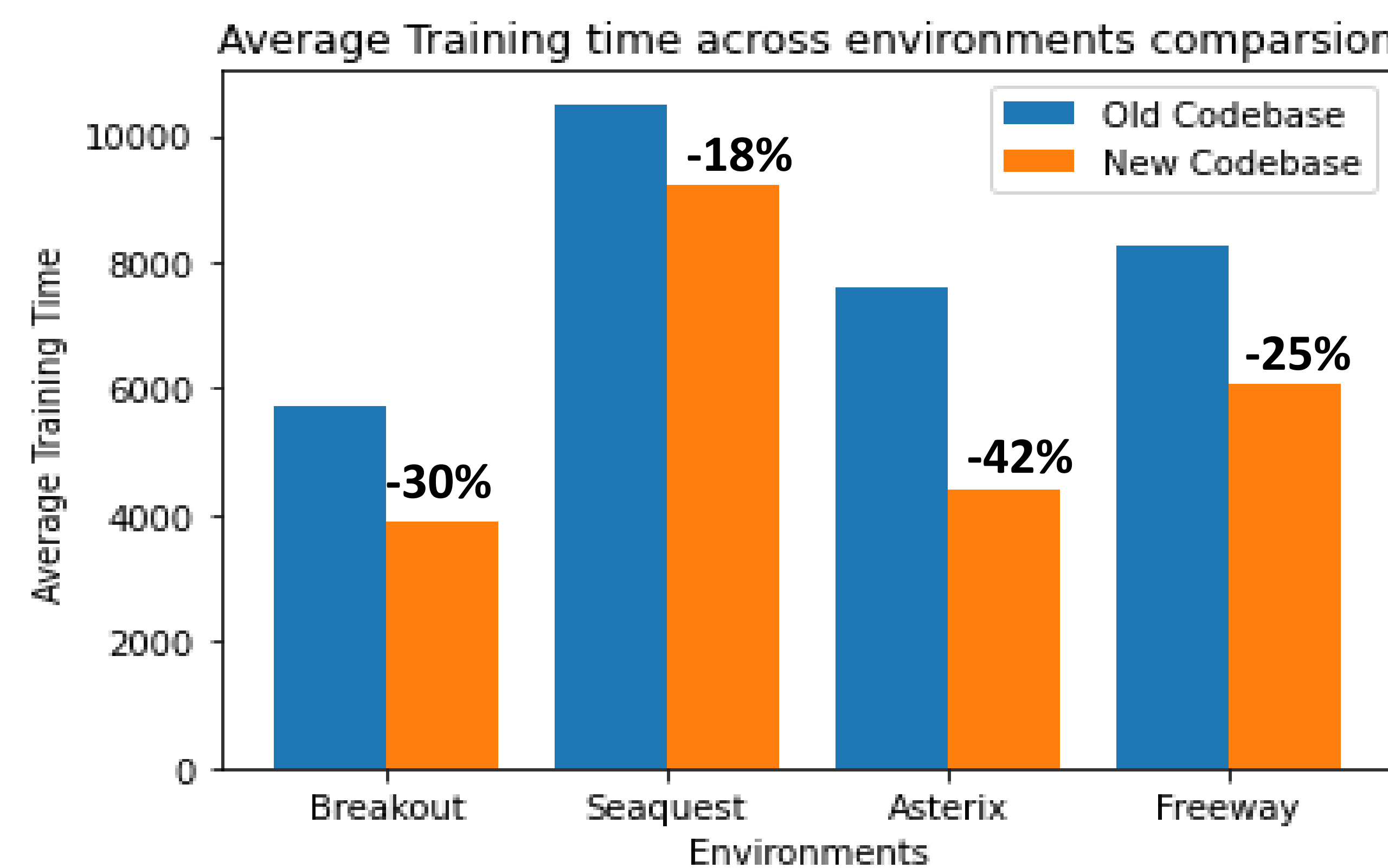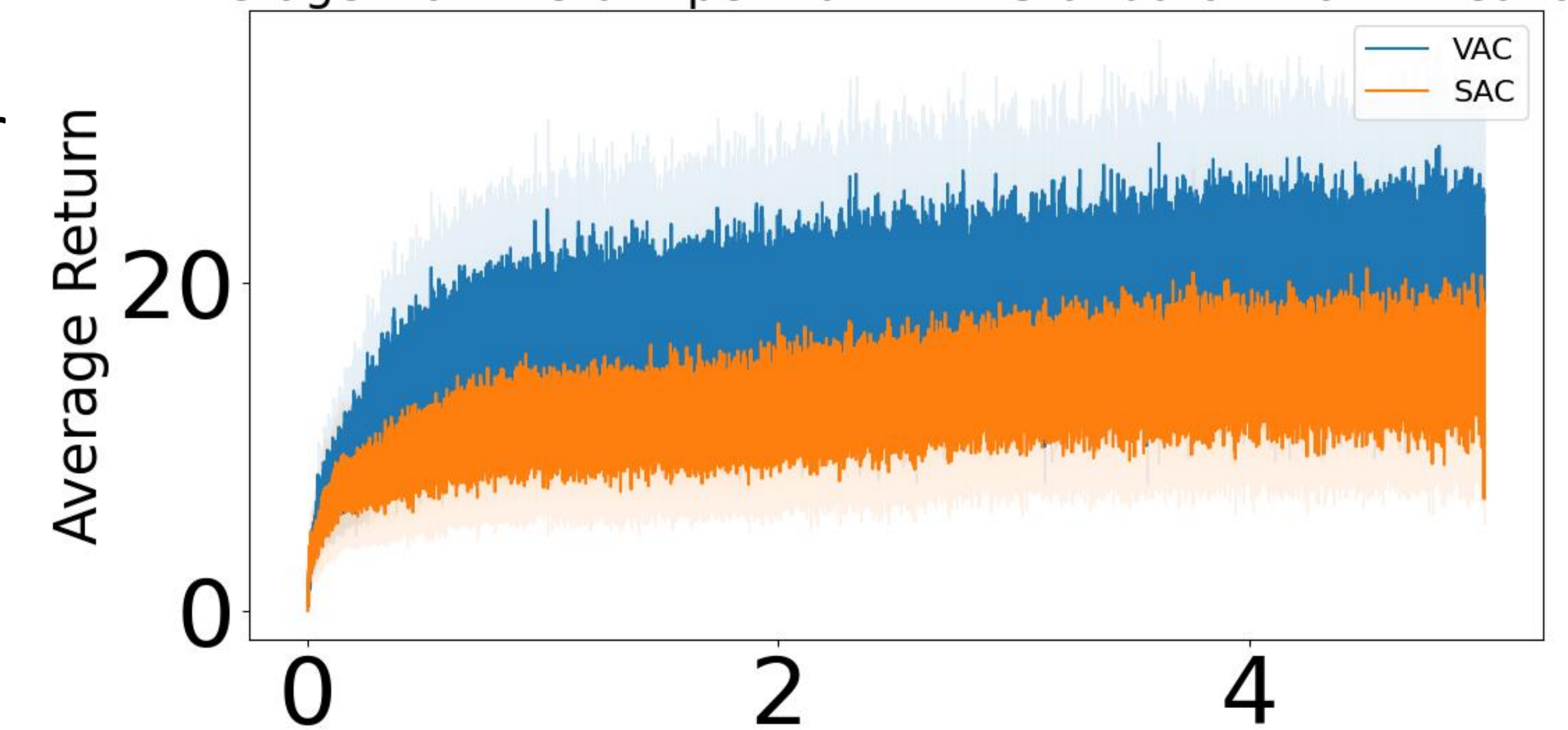

References

➤ Young, K. Tian, T. (2019). MinAtar: An Atari-Inspired Testbed for Thorough and Reproducible Reinforcement Learning Experiments.
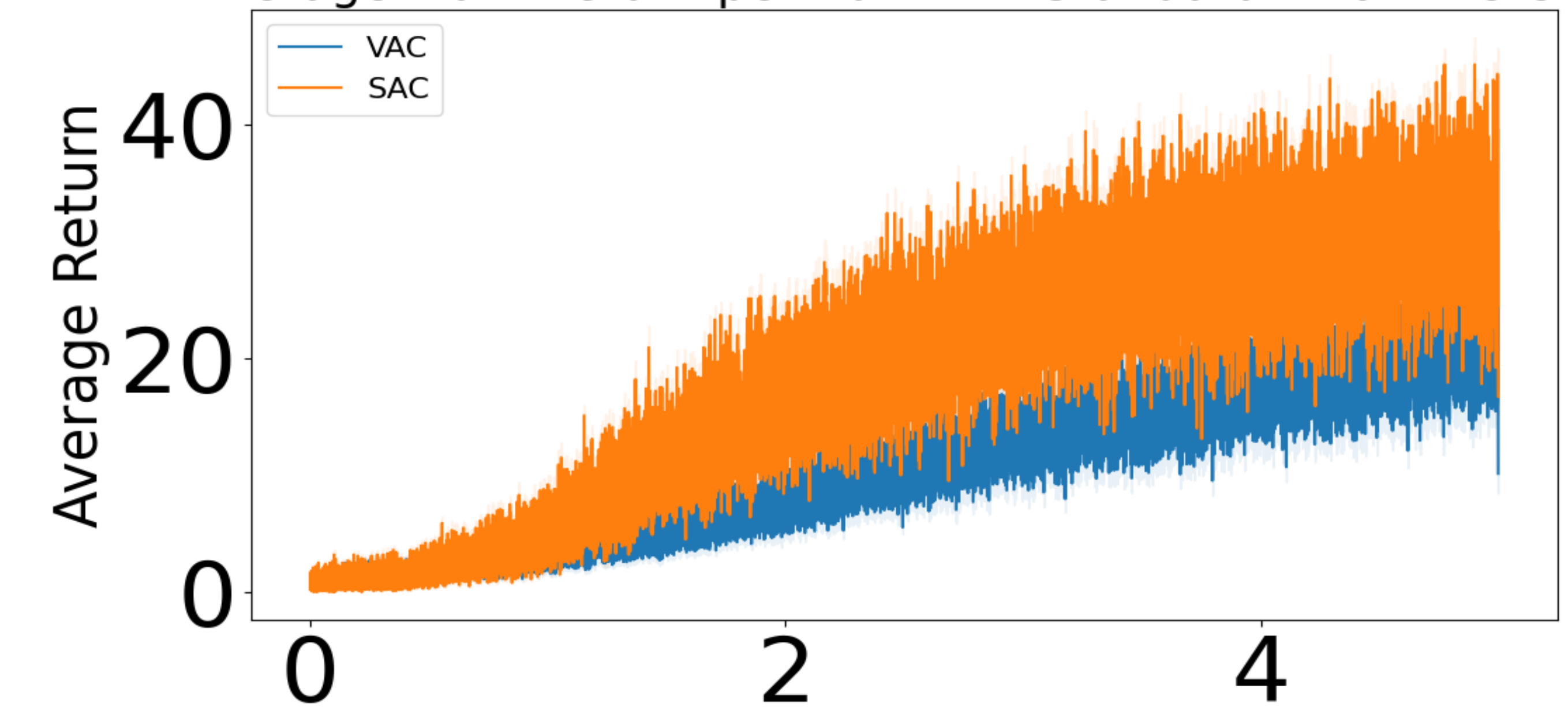
Benchmark

➤ Comparison between the SAC and VAC agents.
➤ 5 Million frames and 2500 steps per episode to compare against the original benchmark in MinAtar

➤ Hyperparameter sweep using the new proposed hyperparameter approach.
➤ This method is more robust and takes into account hyperparameter sensitivity.

Future work

➤ Compare various other algorithms such as DQN to Double DQN and produce more benchmarks.
➤ Prove theoretical guarantees on the new proposed Hyperparameter approach.
➤ Add more environments to MinAtar.
➤ Implement this in other languages.
➤ Scan QR code for more information.