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**Self-Paced Prioritized Curriculum Learning With Coverage Penalty in Deep Reinforcement Learning**

**Abstract**

In this paper, a new training paradigm is proposed for deep reinforcement learning using self-paced prioritized curriculum learning with coverage penalty. The proposed deep curriculum reinforcement learning (DCRL) takes the most advantage of experience replay by adaptively selecting appropriate transitions from replay memory based on the complexity of each transition. The criteria of complexity in DCRL consist of self-paced priority as well as coverage penalty. The self-paced priority reflects the relationship between the temporal-difference error and the difficulty of the current curriculum for sample efficiency. The coverage penalty is taken into account for sample diversity. With comparison to deep Q network (DQN) and prioritized experience replay (PER) methods, the DCRL algorithm is evaluated on Atari 2600 games, and the experimental results show that DCRL outperforms DQN and PER on most of these games. More results further show that the proposed curriculum training paradigm of DCRL is also applicable and effective for other memory-based deep reinforcement learning approaches, such as double DQN and dueling network. All the experimental results demonstrate that DCRL can achieve improved training efficiency and robustness for deep reinforcement learning.