RL: Deep

Prioritized Reply

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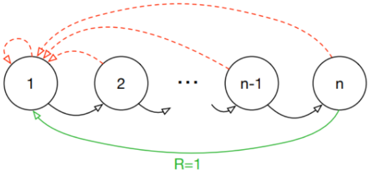
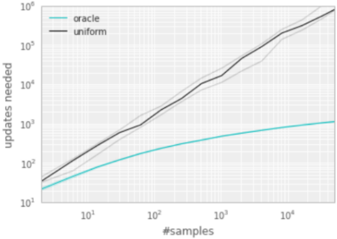
Impact of Replay?

- In tabular TD-learning, order of replaying updates could help speed learning
- Repeating some updates seem to better propagate info than others
- Systematic ways to prioritize updates?

Potential Impact of Ordering Episodic Replay Updates

[Schaul et al. 16]





- Oracle: picks (s, a, r, s') tuple to replay that will minimize global loss
- Exponential improvement in convergence
  - Number of updates needed to converge
- Oracle is not a practical method but illustrates impact of ordering

Prioritized Experience Replay [Schaul et al. 16]

- Let i be the index of the i-th tuple of experience (s_i, a_i, r_i, s_{i+1})
- Sample tuples for update using priority function
- Priority of a tuple i is proportional to DQN error

$$p_i = \left| r + \gamma \max_{a' \in A} Q(s_{i+1}, a'; \mathbf{w}^-) - Q(s_i, a; \mathbf{w}) \right|$$

- Update p_i every update. p_i for new tuples is set to maximum value
- One method: proportional (stochastic prioritization)

$$P(i) = \frac{p_i^\beta}{\sum_k p_k^\beta}$$

- $\beta = 0$ yields random selections