[Practice] Value Functions and Bellman Equations

Practice Quiz • 45 min • 10 total points

1. A policy is a function which maps ____ to ____. **1 point**

- ◯ Actions to probability distributions over values.
- ◯ States to actions.
- ◯ States to values.
- ◯ Actions to probabilities.
- ◯ States to probability distributions over actions.

2. The term “backup” most closely resembles the term ___ in meaning. **1 point**

- ◯ Value
- ◯ Update
- ◯ Diagram

3. At least one deterministic optimal policy exists in every Markov decision process. **1 point**

- ◯ True
- ◯ False

4. The optimal state-value function: **1 point**

- ◯ Is not guaranteed to be unique, even in finite Markov decision processes.
- ◯ Is unique in every finite Markov decision process.

5. Does adding a constant to all rewards change the set of optimal policies in episodic tasks? **1 point**

- ◯ Yes, adding a constant to all rewards changes the set of optimal policies.
- ◯ No, as long as the relative differences between rewards remain the same, the set of optimal policies is the same.

6. Does adding a constant to all rewards change the set of optimal policies in continuing tasks? **1 point**

- ◯ No, as long as the relative differences between rewards remain the same, the set of optimal policies is the same.
- ◯ Yes, adding a constant to all rewards changes the set of optimal policies.

7. Select the equation that correctly relates v_* to q_*. Assume π is the uniform random policy. **1 point**

- ◯ $v_*(s) = \sum_{a,r,s'} \pi(a|s)p(s', r|s, a)[r + q_*(s')]$
- ◯ $v_*(s) = max_a q_*(s, a)$
- ◯ $v_*(s) = \sum_{a,r,s'} \pi(a|s)p(s', r|s, a)[r + \gamma q_*(s')]$
- ◯ $v_*(s) = \sum_{a,r,s'} \pi(a|s)p(s', r|s, a)q_*(s')$

8. Select the equation that correctly relates q_* to v_* using four-argument function p. **1 point**

- ◯ $q_*(s, a) = \sum_{s',r} p(s', r|a, s)[r + v_*(s')]$
- ◯ $q_*(s, a) = \sum_{s',r} p(s', r|a, s)\gamma[r + v_*(s')]$
- ◯ $q_*(s, a) = \sum_{s',r} p(s', r|a, s)[r + \gamma v_*(s')]$

9. Write a policy π_* in terms of q_*. **1 point**

- ◯ $\pi_*(a|s) = q_*(s, a)$
- ◯ $\pi_*(a|s) = \max_{a'} q_*(s, a')$
- ◯ $\pi_*(a|s) = 1 \text{ if } a = \text{argmax}_{a'} q_*(s, a'), \text{ else } 0$

10. Give an equation for some π_* in terms of v_* and the four-argument p. **1 point**

- $\pi_*(a|s) = 1 \text{ if } v_*(s) = \sum_{s',r} p(s', r|s, a)[r + \gamma v_*(s')], \text{ else } 0$
- $\pi_*(a|s) = 1 \text{ if } v_*(s) = \max_{a'} \sum_{s',r} p(s', r|s, a')[r + \gamma v_*(s')], \text{ else } 0$
- $\pi_*(a|s) = \sum_{s',r} p(s', r|s, a)[r + \gamma v_*(s')]$
- $\pi_*(a|s) = \max_{a'} \sum_{s',r} p(s', r|s, a')[r + \gamma v_*(s')]$