2019年04月22日

CSC411 Homework 8

1.

| $P(s'\|s,a)$ | $s'$ | $s$ | $a$ |
|---|---|---|---|
| 0 | $s_1$ | $s_1$ | $a_1$ |
| 1 | $s_2$ | $s_1$ | $a_1$ |
| 1 | $s_1$ | $s_1$ | $a_2$ |
| 0 | $s_2$ | $s_1$ | $a_2$ |
| 0 | $s_1$ | $s_2$ | $a_1$ |
| 1 | $s_2$ | $s_2$ | $a_1$ |
| 1 | $s_1$ | $s_2$ | $a_2$ |
| 0 | $s_2$ | $s_2$ | $a_2$ |

2/3.

| $Q^{\pi_{save}}(s,a)$ | $s$ | $a$ | |
|---|---|---|---|
| $-1+\gamma Q^{\pi_{save}}(s_2, Q^{\pi_{save}}(s_2))$ | $s_1$ | $a_1$ | $= Q^{\pi_s}(s_1,a_1) \equiv a$ |
| $+1+\gamma Q^{\pi_{save}}(s_1, Q^{\pi_{save}}(s_1))$ | $s_1$ | $a_2$ | $= Q^{\pi_s}(s_1,a_2) \equiv b$ |
| $+0+\gamma Q^{\pi_{save}}(s_2, Q^{\pi_{save}}(s_2))$ | $s_2$ | $a_1$ | $= Q^{\pi_s}(s_2,a_1) \equiv c$ |
| $+5+\gamma Q^{\pi_{save}}(s_1, Q^{\pi_{save}}(s_1))$ | $s_2$ | $a_2$ | $= Q^{\pi_s}(s_2,a_2) \equiv d$ |

↳ all $= a_1$

4

$$\begin{cases} a = -1 + \gamma c \\ b = +1 + \gamma a \\ c = 0 + \gamma c \\ d = +5 + \gamma a \end{cases} \Rightarrow c = 0 \Rightarrow a = -1$$

$b = 1 - \gamma$

$d = 5 - \gamma$

Let $\pi_{spend} = \pi_c$

| $Q^{\pi_c}(s,a)$ | $s$ | $a$ | |
|---|---|---|---|
| $-1+\gamma Q^{\pi_c}(s_2,a_2)$ | $s_1$ | $a_1$ | $= Q^{\pi_c}(s_1,a_1) \equiv a$ |
| $+1+\gamma Q^{\pi_c}(s_1,a_2)$ | $s_1$ | $a_2$ | $= Q^{\pi_c}(s_1,a_2) \equiv b$ |
| $+0+\gamma Q^{\pi_c}(s_2,a_2)$ | $s_2$ | $a_1$ | $= Q^{\pi_c}(s_2,a_1) \equiv c$ |
| $+5+\gamma Q^{\pi_c}(s_1,a_2)$ | $s_2$ | $a_2$ | $= Q^{\pi_c}(s_2,a_2) \equiv d$ |

$$\begin{cases} a = -1 + \gamma d \\ b = +1 + \gamma b \\ c = 0 + \gamma d \\ d = 5 + \gamma b \end{cases}$$

$b = \frac{1}{1-\gamma}$

$d = 5 + \frac{\gamma}{1-\gamma} = \frac{5-5\gamma+\gamma}{1-\gamma} = \frac{5-4\gamma}{1-\gamma}$ ← this is expected.

$c = \gamma \frac{5-4\gamma}{1-\gamma}$

$a = -1 - \gamma \frac{5-4\gamma}{1-\gamma}$