

Calangan, Trans I.

COM221

NO.:
DATE:

8-20-25

States s: {Sunny, Cloudy}

Discount $\gamma = 0.9$

Actions a: {Go to school, Stay at home}

$$R_{\text{school}} = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$$

$$R_{\text{stay}} = \begin{bmatrix} -5 \\ 1 \end{bmatrix}$$

$$P_{\text{School}} = \begin{bmatrix} 0.8 & 0.2 \\ 0.4 & 0.6 \end{bmatrix}$$

$$P_{\text{stay}} = \begin{bmatrix} 0.9 & 0.1 \\ 0.3 & 0.7 \end{bmatrix}$$

Step 1:

1) Find r_{π} for sunny =

$$r_{\pi} = 0.5 \times 5 + 0.5 \times (-5) = 0 //$$

2.) find r_{π} for cloudy =

$$r_{\pi} = 0.5 \times 1 + 0.5 \times 3 = 2 //$$

3.) Find r_{π} matrix =

$$r_{\pi} = \begin{bmatrix} 0 \\ 2 \end{bmatrix} //$$

Step 2:

Row 1 (sunny):

$$P_{\pi}(1,1) = 0.5 \times 0.8 + 0.5 \times 0.9 = 0.85$$

$$P_{\pi}(1,2) = 0.5 \times 0.2 + 0.5 \times 0.1 = 0.15$$

Row 2 (cloudy)

$$P_{\pi}(2,1) = 0.5 \times 0.4 + 0.5 \times 0.3 = 0.35$$

$$P_{\pi}(2,2) = 0.5 \times 0.6 + 0.5 \times 0.7 = 0.65$$

$$P_{\pi} = \begin{bmatrix} 0.85 & 0.15 \\ 0.35 & 0.65 \end{bmatrix} //$$

Step 3: Write the Bellman expectation equations v_{π} (sunny)

(a) find $v_1 = 0 + 0.9 (0.85v_1 + 0.15v_2)$

$$v_1 = 0 + 0.745v_1 + 0.135v_2$$

$$v_1 - 0.745v_1 - 0.135v_2 = 0$$

$$0.255v_1 - 0.135v_2 = 0 //$$

Step 3: write the Bellman expectation equations v_{π} (cloudy)

(b) find $v_2 = 2 + 0.9 (0.35v_1 + 0.65v_2)$

$$v_2 = 2 + 0.315v_1 + 0.585v_2$$

$$v_2 - 0.315v_1 - 0.585v_2 = 2$$

$$-0.315v_1 + 0.415v_2 = 2 //$$