

Markov Chain

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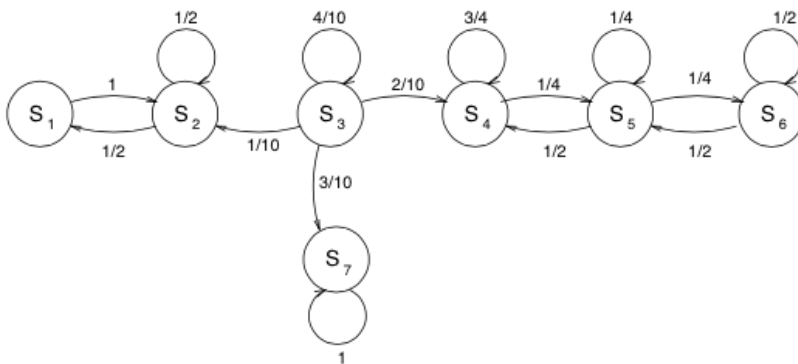
1. Consider a Markov chain with transition matrix

$$P = \begin{array}{c} \text{To} \\ \text{From} \end{array} \begin{array}{c} 1 \quad 2 \quad 3 \\ \begin{bmatrix} 0 & 1 & 0 \\ 0.1 & 0.2 & 0.7 \\ 0.4 & 0 & 0.6 \end{bmatrix} \end{array}$$

2. A Markov chain $X_n, n \geq 0$ with states 0, 1, 2, has the transition probability matrix

$$P = \begin{bmatrix} 1/2 & 1/3 & 1/6 \\ 0 & 1/3 & 2/3 \\ 1/2 & 0 & 1/2 \end{bmatrix}$$

- (a) Compute $P(X_3 = 2 | X_1 = 0)$.
 - (b) Determine $P(X_5 = 1, X_2 = 0 | X_0 = 2)$.
 - (c) Suppose that the initial distribution of X_0 is $\pi^{(0)} = (0.25 \quad 0.35 \quad 0.4)$. Find the unconditional distribution of X_2 and then compute $E(X_2)$.
 - (d) Find the stationary distribution of this Markov chain
3. Consider the Markov chain below.



For all parts of this problem, the process is in state 3 immediately before the first transition.

- (a) Classify all states of the Markov chain.
- (b) Determine all recurrence class and indicate which one is periodic.