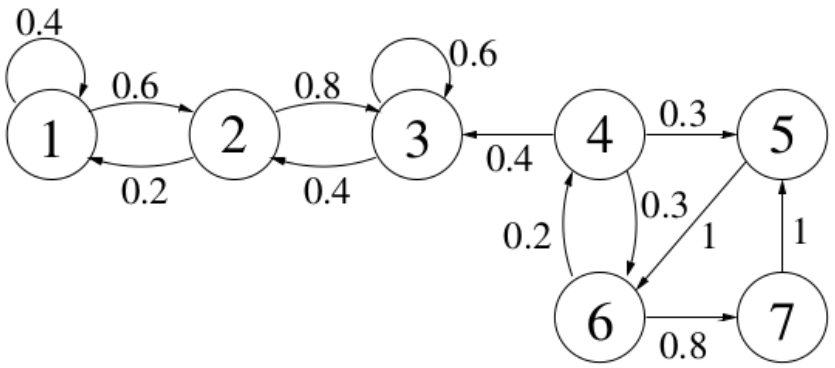
5. Exercise: Path calculation

None due May 29, 2020 05:29 IST

Exercise: Path calculation

0.0/3.0 points (ungraded)

Consider a Markov chain with the following transition probability graph:



1. $\mathbf{P}\left(X_1 = 6, X_2 = 4, X_3 = 3 \mid X_0 = 4\right) =$ [ ]

   Answer: 0.024

2. $\mathbf{P}\left(X_{103} = 3 \mid X_{100} = 1\right) =$ [ ] **Answer:** 0.48

Solution:

1. The desired probability corresponds to a unique path through the Markov chain. Hence, we can simply multiply one-step transition probabilities along the path:

$$\mathbf{P}\left(X_1 = 6, X_2 = 4, X_3 = 3 \mid X_0 = 4\right) = p_{46}p_{64}p_{43} = (0.3)\,(0.2)\,(0.4) =$$

2. We are looking for the 3-step transition probability from state 1 to state 3, $r_{13}(3)$. We can always use the recursion formula to calculate this, but in this particular case, we can directly observe that there are only 2 possible paths: $1 \to 1 \to 2 \to 3$ and $1 \to 2 \to 3 \to 3$. Hence,

$$\begin{aligned}\mathbf{P}(X_{103} = 3 \mid X_{100} = 1) &= p_{11}p_{12}p_{23} + p_{12}p_{23}p_{33} \\ &= (0.4)(0.6)(0.8) + (0.6)(0.8)(0.6) \\ &= 0.48.\end{aligned}$$

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Answers are displayed within the problem

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