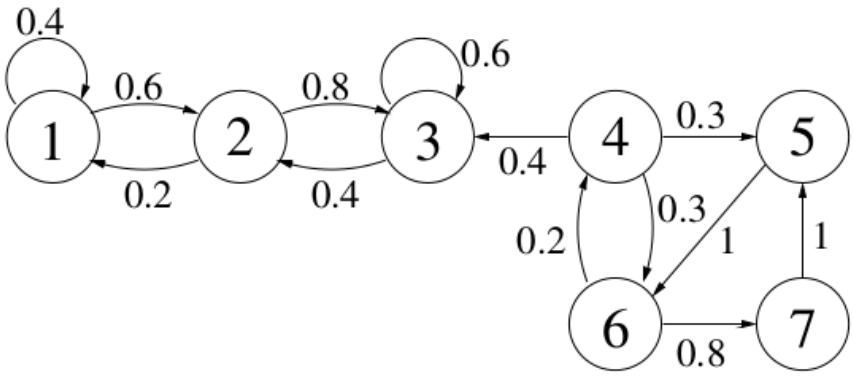
12. Exercise: Steady-state calculation

None due May 29, 2020 05:29 IST

Exercise: Steady-state calculation

0.0/4.0 points (ungraded)

Consider again the Markov chain with the following transition probability graph:



Find the steady state distribution of the Markov chain.

$\pi_1 =$ **Answer:** 0.1

$\pi_2 =$ **Answer:** 0.3

$\pi_3 =$ **Answer:** 0.6

$\pi_4 =$ **Answer:** 0

$\pi_5 =$ **Answer:** 0

$\pi_6 =$ [ ] **Answer:** 0

$\pi_7 =$ [ ] **Answer:** 0

Solution:

First note that states 4 through 7 are transient since the chain will eventually transition from state 4 to state 3 and never return. Transient states have zero steady-state probability, so $\pi_4 = \pi_5 = \pi_6 = \pi_7 = 0$.

Hence, to calculate the rest of the steady-state probabilities, we can simply focus on the part of the chain involving states 1 through 3. The balance and normalization equations are

$$\begin{aligned}
\pi_1 &= \pi_1 p_{11} + \pi_2 p_{21} = 0.4\pi_1 + 0.2\pi_2 \\
\pi_2 &= \pi_1 p_{12} + \pi_3 p_{32} = 0.6\pi_1 + 0.4\pi_3 \\
\pi_3 &= \pi_2 p_{23} + \pi_3 p_{33} = 0.8\pi_2 + 0.6\pi_3 \\
1 &= \pi_1 + \pi_2 + \pi_3
\end{aligned}$$

Solving for π_1, π_2, π_3, we obtain $\pi_1 = 0.1$, $\pi_2 = 0.3$, and $\pi_3 = 0.6$.

Submit You have used 0 of 3 attempts

Answers are displayed within the problem

Discussion

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Topic: Unit 10: Markov chains:Lec. 25: Steady-state behavior of Markov chains / 12. Exercise: Steady-state calculation

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- No programming needed — 2
  This problem can be solved by paper and pencil. Transient states eventually will have zero probability to ...
- Hand vs Software calculation — 5
  We should prepare ourselves for the capstone exam. I saw very appealing solutions here in Python and ...
- Matrix notation (solution with numpy)

solution with matrices 8

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