

Planing, Learning and Intelligent Decision Making - Homework 2

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February 22, 2024

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1 Question 1

1 a)

Using \mathbb{X} as the state space, $\mathbb{X} = \{A, B, C\}$.

The transition matrix is given by $\begin{bmatrix} 0 & 1 & 0 \\ 0.5 & 0 & 0.5 \\ 1 & 0 & 0 \end{bmatrix}$.

Where the first row represents the transition probabilities from state A, the second row from state B and the third row from state C. Each column represents the transition probabilities to state A, B and C, respectively.

The diagram of the Markov chain is given by

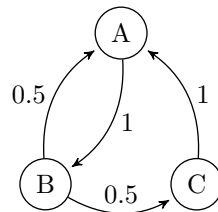


Figure 1: Markov Chain

1 b)

For state A, we have 2 possible paths to reach state A again, $A \rightarrow B \rightarrow A$ and $A \rightarrow B \rightarrow C \rightarrow A$. With the transition matrix, we can calculate the probability of each path.

Using x_t to represent the state at time t.

The probability of the first path is $P(x_1 = B|x_0 = A) * P(x_2 = A|x_1 = B) = 1 * 0.5 = 0.5$.

The probability of the second path is $P(x_1 = B|x_0 = A) * P(x_2 = C|x_1 = B) * P(x_3 = A|x_2 = C) = 1 * 0.5 * 1 = 0.5$.

Since the first path takes 2 steps and the second path takes 3 steps, $T_{AA} = 0.5 * 2 + 0.5 * 3 = 2.5$.

1 c)