MITx: 6.041x Introduction to Probability - The Science of Uncertainty

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Problem 3: Checking the Markov property

(6/7 points)

For each one of the following definitions of the state X_k at time k (for $k = 1, 2, \ldots$), determine whether the Markov property is satisfied by the sequence $X_1, X_2, \ldots$.

1. A fair six-sided die (with sides labelled $1, 2, \ldots, 6$) is rolled repeatedly and independently.

   (a) Let X_k denote the largest number obtained in the first k rolls. Does the sequence $X_1, X_2, \ldots$ satisfy the Markov property?

   Yes ▼ ✔

   (b) Let X_k denote the number of 6's obtained in the first k rolls, up to a maximum of ten. (That is, if ten or more 6's are obtained in the first k rolls, then $X_k = 10$.) Does the sequence $X_1, X_2, \ldots$ satisfy the Markov property?

   Yes ▼ ✔

   (c) Let Y_k denote the result of the k^{th} roll. Let $X_1 = Y_1$, and for $k \geq 2$, let $X_k = Y_k + Y_{k-1}$. Does the sequence $X_1, X_2, \ldots$ satisfy the Markov property?

No ✔

(d) Let $Y_k = 1$ if the k^{th} roll results in an odd number; and $Y_k = 0$ otherwise. Let $X_1 = Y_1$, and for $k \geq 2$, let $X_k = Y_k \cdot X_{k-1}$. Does the sequence $X_1, X_2, \ldots$ satisfy the Markov property?

Yes ✔

2. Let Y_k be the state of some Markov chain at time k (i.e., it is known that the sequence $Y_1, Y_2, \ldots$ satisfies the Markov property).

(a) For a fixed integer $r > 0$, let $X_k = Y_{r+k}$. Does the sequence $X_1, X_2, \ldots$ satisfy the Markov property?

Yes ✔

(b) Let $X_k = Y_{2k}$. Does the sequence $X_1, X_2, \ldots$ satisfy the Markov property?

No ✖

(c) Let $X_k = (Y_k, Y_{k+1})$. Does the sequence $X_1, X_2, \ldots$ satisfy the Markov property?

Yes ✔

Lec. 26: Absorption probabilities and expected time to absorption
Exercises 26 due May 18, 2016 at 23:59 UTC

Solved problems

Problem Set 10
Problem Set 10 due May 18, 2016 at 23:59 UTC

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