Week 5: Assignment 5

The due date for submitting this assignment has passed.

Due on 2021-09-29, 23:59 IST.

As per our records you have not submitted this assignment.

1) Let $X_0, X_1, X_2, X_3 \ldots$ be a Markov Chain. Then what can we say about $X_0, X_2, X_4, \ldots$? *1 point*

- It is a Markov Chain
- It is not a Markov Chain
- It is Markov only if X_i is homogeneous
- It is not possible to make any conclusions

No, the answer is incorrect.
Score: 0
Accepted Answers:
It is a Markov Chain

2) Let $X_1, X_2, X_3 \ldots$ be a Markov Chain. Then what can we say about $X_2, X_3, X_5, X_7 \ldots$ where the new sequence only consists of X_p for prime p? *1 point*

- It is a Markov Chain
- It is not a Markov Chain
- It is Markov only if X_i is homogeneous
- It is not possible to make any conclusions

No, the answer is incorrect.
Score: 0
Accepted Answers:
It is a Markov Chain

3) Consider the markov chain with three states, $S = \{1, 2, 3\}$ that has the following transition matrix: *1 point*

$$M = \begin{bmatrix} 1/2 & 1/4 & 1/4 \\ 1/3 & 0 & 2/3 \\ 1/2 & 1/2 & 0 \end{bmatrix}$$

If we know that $P(X_1 = 1) = P(X_1 = 2) = 1/4$, what is $P(X_1 = 3, X_2 = 2, X_3 = 1)$?

- 1/3
- 1/14
- 1/12
- 1/7

No, the answer is incorrect.
Score: 0
Accepted Answers:
1/12

4) Consider an experiment of mating rabbits. We watch the evolution of a particular gene that appears in two types, G or g. A rabbit has a pair of genes, either GG (dominant), Gg (hybrid–the order is irrelevant, so gG is the same as Gg) or gg (recessive). In mating two rabbits, the offspring inherits a gene from each of its parents with equal probability. Thus, if we mate a dominant (GG) with a hybrid (Gg), the offspring is dominant with probability 1/2 or hybrid with probability 1/2.
Start with a rabbit of given character (GG, Gg, or gg) and mate it with a hybrid. The offspring produced is again mated with a hybrid, and the process is repeated through a number of generations, always mating with a hybrid.
What is the transition matrix of the Markov Chain the above process defines?
(Consider the states to be $S = \{GG, Gg, gg\}$ in that order while constructing the matrix) *1 point*

- $\begin{bmatrix} 1/2 & 1/4 & 1/4 \\ 1/3 & 0 & 2/3 \\ 1/2 & 1/2 & 0 \end{bmatrix}$
- $\begin{bmatrix} 0 & 1/2 & 1/2 \\ 1/2 & 1/4 & 1/4 \\ 1 & 0 & 0 \end{bmatrix}$
- $\begin{bmatrix} 1/2 & 1/2 & 0 \\ 1/3 & 0 & 2/3 \\ 1/2 & 1/2 & 0 \end{bmatrix}$
- $\begin{bmatrix} 1/2 & 1/2 & 0 \\ 1/4 & 1/2 & 1/4 \\ 0 & 1/2 & 1/2 \end{bmatrix}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\begin{bmatrix} 1/2 & 1/2 & 0 \\ 1/4 & 1/2 & 1/4 \\ 0 & 1/2 & 1/2 \end{bmatrix}$

5) Suppose that the transition matrix M of a markov chain is *1 point*

$$\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

Suppose that the initial probability distribution is [1/2, 1/4, 1/4]. What is the final probability distribution after 2021 steps?

- [1/4,1/2,1/4]
- [1/4,1/4,1/2]
- [1/3,1/3,1/3]
- [1/4,0,3/4]

No, the answer is incorrect.
Score: 0
Accepted Answers:
[1/4,1/4,1/2]