Quiz #1

Started: 10 Oct at 10:27

Quiz instructions

General Quiz Information

(https://bruinlearn.ucla.edu/courses/173226/files/14494000?wrap=1)

You will answer the quiz questions with sensible answers to gain full credit. Any blank, non-sense, unfinished answers will not be counted. You may upload pdf or png files to answer the questions.

Here is some general information that may be helpful in using Canvas Quizzes.

- You must complete and submit your answers for each quiz by the due date
- For a timed quiz, **you can't stop the clock once you begin**. If time runs out, your quiz will close.
- When you are done answering the questions and are ready to submit your answers for grading, click **Submit Quiz**.
- If you experience a technical problem that interferes with your ability to complete a quiz during the specified time, contact your instructor as soon as possible—you don't have to wait until the quiz has closed.

Question 1 — 3 pts

Supposed the CDF of random variable X is

$$F_X(c) = \begin{cases} 0 & c \leq 0 \\ 1 - cos(c) & 0 \leq c \leq \pi/2 \\ 1 & 1 \end{cases}.$$

(a) Please find the pdf of X.

(b) What is E(X)?

(c) What is Var(X)?

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12pt Paragraph

a) $f_x(c) = sin(c), 0 \leq c \leq \frac{\pi}{2}$

b) $E(X) = \int_0^{\frac{\pi}{2}} c * sin(c) dc = [sin(c)]_0^{\frac{\pi}{2}} = 1$

c) $Var\,(X) = E(X^2) - (E(X))^2$

$Var(X) = \int_0^{\frac{\pi}{2}} c^2 * sin(c) dc - 1 = [2sin(c)]_0^{\frac{\pi}{2}} - 1 = 2 - 1 = 1$

p 3 words </>

Question 2 3 pts

Suppose the probability that Dave wins a chess game against his favorite computer program is 0.4. Assume each game is independent.

(a) What is the probability that Dave will the first game when he plays his fourth game?

(b) Find the probability that Dave's fifth win happens when he plays his eighth game

(c) Find the probability that Dave wins 7 games when he plays 10 games.

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12pt Paragraph

a) $P(X = 4) = (1 - 0.4)^3(0.4) = 0.0864$

b) $P(X = 4) = \binom{7}{4}(0.4)^4(0.6)^3 = 0.193536$

$P(X = 5) = 0.193536 * 0.4 = 0.0774144$

c) $P(X = 7) = \binom{10}{7}(0.4)^7(0.6)^3 = 0.04246733$

p 2 3 words

Question 3 2 pts

Suppose $x_1, \ldots, x_{50} \sim Unif(0, 2)$.

(a) What is $E[\hat{F}_n(1)]$?

(b) What is $Var[\hat{F}_n(1)]$?

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12pt Paragraph

a) $E(\hat{F}_n(1)) = E(\frac{\Sigma_{i=1}^n I(x_i \leq 1)}{n}) = \frac{1}{n}\Sigma_{i=1}^n \frac{1}{2} = \frac{1}{2}$

b)

$Var(\hat{F}_n(1)) = Var(\frac{\Sigma_{i=1}^n I(x_i \leq 1)}{n}) = \frac{1}{n^2}\Sigma_{i=1}^n Var(I(x_i \leq 1)) = \frac{1}{n^2}\Sigma_{i=1}^n \frac{1}{4} = \frac{1}{4n} = \frac{1}{200}$

p 2 words </>

Question 4 2 pts

Given an integer vector $v = [x_1, \ldots, x_n]^T$, please write R code to compute ECDF $\hat{F}_n(x_0)$, where x_0 is a new oberservation.

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12pt Paragraph

```
ecdf_func <- function(v, x0){
    return(sum(v <= x0) / length(v))
}
```

p 12 words

Saved at 11:03 Submit quiz