Homework 6
BSTA 550

Directions

Please turn in this homework on Sakai. Please submit your homework in pdf or html format.

You can type your work on your computer or submit a photo of your written work or any other method that can be turned into a pdf. The Adobe Scan phone app is an easy way to scan photos and compile into a PDF. Please let me know if you greatly prefer to submit a physical copy. We can work out another way for you to turn in homework.

You must show all of your work to receive credit.

Extra problems do not need to be turned in!

Questions

1. From last homework: The following table shows the results of a survey in which the subjects were a sample of 300 adults residing in a certain metropolitan area. Each subject was asked to indicate which of three policies they favored with respect to smoking in public places. (Table is from *Biostatistics: A Foundation for Analysis in the Health Sciences*, 10th Edition, Daniel, Wayne W.; Cross, Chad L., pg. 630)

	Policy Favored				
Highest Education Level	**No Restrictions on Smoking**	**Smoking Allowed in Designated Areas Only**	**No Smoking at All**	**No Opinion**	**Total**
College graduate	5	44	23	3	75
High-school graduate	15	100	30	5	150
Grade-school graduate	15	40	10	10	75
Total	35	184	63	18	300

Let X = highest education level and Y = policy favored. We can let $X = 1$ for college graduate, $X = 2$ for high-school graduate, etc., and similarly for Y, or just keep the category names for the different levels of X and Y

   g. Make a table for the conditional pmf $p_{X|Y}(x|y)$ and briefly describe in words what the values are the probability of.

   h. Make a table for the conditional pmf $p_{Y|X}(y|x)$ and briefly describe in words what the values are the probability of.

2. Each day, Maude has a 1% chance of losing her cell phone (her behavior on different days is independent). Each day, Maude has a 3% chance of forgetting to eat breakfast (again, her behavior on different days is independent). Her breakfast and cell phone habits are independent. Let X be the number of days until she first loses her cell phone. Let Y be the number of days until she first forgets to eat breakfast. (Here, X and Y are independent.)

   a. Find the joint probability mass function of X and Y.

   b. Find the joint cdf of X and Y and briefly explain what $F_{X,Y}(x,y)$ represents in the context of the problem. (Hint: $\sum_{n=1}^{N} r^{n-1} = \frac{1-r^N}{1-r}$ for $r \neq 1$.)

   c. Find the conditional pmf $p_{Y|X}(y|x)$.

3. Consider a pair of random variables X, Y with constant joint density on the quadrilateral with vertices $(0,0)$, $(2,0)$, $(2,6)$, $(0,12)$.

   a. For $0 \leq y \leq 6$, find the conditional density $f_{X|Y}(x,y)$ of X, given $Y = y$.
   b. For $6 \leq y \leq 12$, find the conditional density $f_{X|Y}(x,y)$ of X, given $Y = y$.
   c. Find the conditional probability that $X \leq 1$, given $3 \leq Y \leq 9$.
   d. Find $P(0.5 \leq X \leq 3|Y = 4)$
   e. Find $P(0.5 \leq X \leq 3|Y = 7)$