3. Exercise: Conditional PMFs

Exercises due Feb 28, 2020 05:29 IST *Completed*

Exercise: Conditional PMFs

7/7 points (graded)

For each of the formulas below, state whether it is true or false.

a) $p_{X,Y,Z}\left(x,y,z\right) = p_Y\left(y\right)\, p_{Z|Y}\left(z \mid y\right)\, p_{X|Y,Z}\left(x \mid y,z\right)$

True ✔ **Answer:** True

b) $p_{X,Y|Z}\left(x,y \mid z\right) = p_X\left(x\right)\, p_{Y|Z}\left(y \mid z\right)$

False ✔ **Answer:** False

c) $p_{X,Y|Z}\left(x,y \mid z\right) = p_{X|Z}\left(x \mid z\right)\, p_{Y|X,Z}\left(y \mid x,z\right)$

True ✔ **Answer:** True

d) $\sum_x p_{X,Y|Z}\left(x,y \mid z\right) = 1$

False ✔ **Answer:** False

e) $\sum_x \sum_y p_{X,Y|Z}\left(x,y \mid z\right) = 1$

True ✔ **Answer:** True

f) $p_{X,Y|Z}\left(x,y \mid z\right) = \dfrac{p_{X,Y,Z}\left(x,y,z\right)}{p_Z\left(z\right)}$

True ✔ **Answer:** True

g) $p_{X|Y,Z}\left(x \mid y,z\right) = \dfrac{p_{X,Y,Z}\left(x,y,z\right)}{p_{Y,Z}\left(y,z\right)}$

True ✔ **Answer:** True

Solution:

a) True. This is the usual multiplication rule for the probability of three events occurring simultaneously.

b) False. This does not follow from any of the formulas we have developed.

c) True. This is the usual multiplication rule for the event $\{X = x \text{ and } Y = y\}$, in a conditional model in which it is given that the event $\{Z = z\}$ has occurred.

d) False. The left-hand side is a function of y, whereas the right-hand side is not.

e) True. This is the usual normalization property, in a conditional model in which it is given that the event $\{Z = z\}$ has occurred.

f) True. This is just the formula for the conditional probability $\mathbf{P}\left(X = x, Y = y \mid Z = z\right)$.

g) True. This is just the formula for the conditional probability $\mathbf{P}\left(X = x \mid Y = y, Z = z\right)$.

Submit You have used 1 of 1 attempt

Answers are displayed within the problem

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? (c)
Is (c) in the same line with (a), the joint PMF (X,Y,Z) ? ie; z has occured (conditional) & x,y is gonna occur .

Counterexamples for false statements

I got this problem right, but it would be nice if you gave a specific counter-example for any statements th... 7

I don't understand the answer to B

Is the LHS = p(x,y,z)/p(z)? Is the RHS's PYgivenZ = p(y,z))/p(z)? 4

b) and c)

Might someone be able to give a helpful hint explaining b) and c) better than the Solution explanations? ... 10