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Week 1: Introduction to Probability
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Week 1: Probability Spaces and Events
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Week 1: Random Variables
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Week 2: Conditioning on Events
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Exercise: Conditioning for Random Variables

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Exercise: Conditioning for Random Variables

4 points possible (graded)

Consider the following two joint probability tables.

W \ I	1	0
sunny	1/2	0
rainy	0	1/6
snowy	0	1/3

X \ Y	1	0
sunny	1/4	1/4
rainy	1/12	1/12
snowy	1/6	1/6

- What is $p_{W|I}(\text{sunny}|1)$?

Answer: 1

- What is $p_{X|Y}(\text{sunny}|1)$?

Answer: 0.5

- What is $p_{I|W}(1|\text{snowy})$?

Answer: 0

- What is $p_{Y|X}(1|\text{snowy})$?

Answer: 0.5

Solution:

- What is $p_{W|I}(\text{sunny}|1)$?

  Solution:

$$p_{W|I}(\text{sunny}|1) = \frac{p_{W,I}(\text{sunny}, 1)}{p_I(1)} = \frac{1/2}{p_I(1)}.$$

Meanwhile,

$$p_I(1) = 1/2 + 0 + 0 = 1/2.$$

Thus combining the above two equations,

$$p_{W|I}(\text{sunny}|1) = \frac{1/2}{p_I(1)} = \frac{1/2}{1/2} = \boxed{1}.$$

- What is $p_{X|Y}(\text{sunny}|1)$?

  Solution:

  $$p_{X|Y}(\text{sunny}|1) = \frac{p_{X,Y}(\text{sunny}, 1)}{p_Y(1)} = \frac{1/4}{p_Y(1)}.$$

  Meanwhile,

  $$p_Y(1) = 1/4 + 1/12 + 1/6 = 1/2.$$

  Thus combining the above two equations,

  $$p_{X|Y}(\text{sunny}|1) = \frac{1/4}{p_Y(1)} = \frac{1/4}{1/2} = \boxed{1/2}.$$

- What is $p_{I|W}(1|\text{snowy})$?

Solution:

$$p_{I|W}(1|\text{snowy}) = \frac{p_{W,I}(\text{snowy}, 1)}{p_W(\text{snowy})} = \frac{0}{p_W(\text{snowy})} = \boxed{0}.$$

- What is $p_{Y|X}(1|\text{snowy})$?

  Solution:

  $$p_{Y|X}(1|\text{snowy}) = \frac{p_{X,Y}(\text{snowy}, 1)}{p_X(\text{snowy})} = \frac{1/6}{p_X(\text{snowy})}.$$

  Meanwhile,

  $$p_X(\text{snowy}) = 1/6 + 1/6 = 1/3.$$

  Thus combining the above two equations,

  $$p_{Y|X}(1|\text{snowy}) = \frac{1/6}{p_X(\text{snowy})}. = \frac{1/6}{1/3}. = \boxed{1/2}.$$

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Discussion

Topic: Jointly Distributed Random Variables / Exercise: Conditioning for Random Variables

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possible error

question posted 2 months ago by **kalosobat**

How is pY|X(1|snowy) not 1/3

This post is visible to everyone.

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Syntax in this exercise

discussion posted 2 months ago by **deep-one**

What kind of syntax does the grader accept? Neither Python {'hot': 1/2, 'cold': 1/2} nor math {hot: 1/2, cold:1/2} don't work. Even the figure-based...

This post is visible to everyone.

+ Expand discussion

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