Assignment 3 Question 4

Friday, October 9, 2020 9:48 AM

"My X is a boy"

X = chosen randomly

Attn is named X here for short notation

50-50 if Boy-Girl

This is crucial for the numbers to hold.

$$P\left(\frac{\text{Boy-Girl}}{\text{1 is a Boy}}\right) = P\left(\frac{\text{X is a Boy}}{\text{Boy-Girl}}\right)\frac{P(\text{Boy-Girl})}{P(\text{X is a Boy})}$$

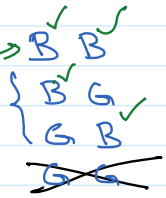
* Boy-Girl is unordered in our notation

All terms are also conditioned on → Atleast 1 Boy of the 2

$\Rightarrow P(\text{Boy-Girl}) = 0.66$

$$P\left(\frac{\text{X is a Boy}}{\text{Boy-Girl}}\right) = 0.5$$

$P(\text{X is a Boy}) = 0.66$



Alternatively $P(\text{X is a boy})$

$$= P(\text{Boy-Girl})\,P\left(\frac{\text{X is a boy}}{\text{Boy-girl}}\right) + P(\text{Boy-Boy})\,P\left(\frac{\text{X is a boy}}{\text{Boy-Boy}}\right)$$

$$= \frac{1}{2}\times\frac{2}{3} + \frac{1}{1}\times\frac{1}{3} = \frac{4}{6} = \frac{2}{3}$$

$$\therefore P\left(\frac{\text{Boy-Girl}}{\text{X is a boy}}\right) = 0.5 \cdot \frac{0.66}{0.66} = 0.5$$

Everything adds up

Information was gained when we got a FAIR sampling from the 2 children

If the parent is such that he will always name the boy, no information will be gained

Hand-wavy point:

My X is a boy ✓ information

My box is named X ✗ no-information