Engineering Statistics Lecture IX

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Abstract

HW #1 is due October 1, 2019 HW #2 is due October 10, 2019:

- Section 2.3 #23-37 odd
- \bullet Section 2.4 #49-65 odd
- \bullet Section 2.5 #73-93 odd

1 Example: highway patrol

Spoz the highway patrol guys have nothing better to do than conduct random DUI checks. Historically-speaking, 10% of drivers are legally-impaired in any given instance. If they check 50 drivers in an hour, what is the probability that 6 of the 50 are impaired?

Rephrase: What is P(6 of 50)?

CONTINUE LATER

2 Example: Noah again

Spoz Noah works at an electronics store. Let event A be the case in which a customer buys a stylus and B be the case where a customer buys an external drive, such that S is the set of cases wherein a customer buys a laptop. Spoz that $P(A) = \frac{1}{4}$ and $P(B) = \frac{1}{5}$ and that $P(A \cap B) = \frac{1}{10}$.

What is P(B|A)?

$$P(B|A) = \frac{P(B \cap A)}{P(A)}$$

$$= \frac{.10}{.25}$$

$$= 0.4$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{.10}{.20}$$

$$= 0.5$$

B is independent from A because $P(A|B) \neq P(A)$.

$$(A indep. B) \iff P(A|B) = P(A)$$
 (1)

3 Brian at the ER

Spoz Brian is working the Friday night shift at the ER: Three events: Pediatric, Geriatric, Average-age adults.

P(Pediatric)	= 0.25
P(Geriatric)	= 0.15
P(Average)	= 0.60

You might notice that the three events above are the entire sample set and, therefore, definitively mutually exclusive.

Now, B is the event that a patient will return within 3 days:

$$P(B|Pediatric)$$
 = 0.10
 $P(B|Geriatric)$ = 0.80
 $P(B|Average)$ = 0.50

Note that just because the initial given cases were independent does NOT mean that the cases of them being a given for a particular event will add up.

$$\begin{split} &P(Pediatric|B) = P(B|Pediatric) \frac{P(Pediatric)}{P(B)} \\ &P(Geriatric|B) = P(B|Geriatric) \frac{P(Geriatric)}{P(B)} \\ &P(Average|B) = P(B|Average) \frac{P(Average)}{P(B)} \end{split}$$

$$\begin{array}{ll} P(B) = & P(B|Pediatric) * P(Pediatric) \\ + & P(B|Geriatric) * P(Geriatric) \\ + & P(B|Average) * P(Average) \\ = & (0.1)(0.25) + (0.80)(0.15) + (0.50)(0.60) \\ = & 0.181 \end{array}$$

Therefore,

$$P(Pediatric|B) = 0.10 \frac{0.25}{0.181}$$

$$P(Geriatric|B) = 0.80 \frac{0.15}{0.181}$$

$$P(Average|B) = 0.60 \frac{0.50}{0.181}$$

Which doesn't make sense, so we'll get back to it on Tuesday, October 1, $2019\,$

$$\int_{-\infty}^{+\infty} f(x)dx = 1$$