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Course – CSE922
Section — 06 .

Assignment – 01

Exercise 1: Inference from Joint.

→ what is the prior probability of smart?

$P(smart) = 0.432 + 0.16 + 0.048 + 0.16 = 0.8$

→ what is the prior probability of study?

$P(study) = 0.6$

→ What is the conditional probability of prepared, given study and smart?

$P(prepared | study \cap smart) = ?$

$$= \frac{P(prepared \cap study \cap smart)}{P(study \cap smart)}$$

$$= \frac{0.432}{0.48}$$

$$= \frac{9}{10} = 0.9$$

Exercise 2 :

→ Is smart independent of study ?

$P(smart)$ . . . . = . . .

smart and study are independent if

$P(smart \cap independent) = P(smart) * P$

$P(smart \cap study) = P(smart) * P(study)$

∴ $P(smart \cap study) = 0.432 + 0.048 = 0.48$.

∴ $P(smart) = 0.8$

& $P(study) = 0.6$

∴ $P(smart) * P(study) = 0.8 \times 0.6 = 0.48$

∴ $P(smart \cap study) = P(smart) \, P(study)$

∴ Smart is independent of study.

→ Is prepared independent of study ?

∴ $P(prepared \cap study) = 0.516$.

∴ $P(prepared) = 0.689$.

∴ $P(study) = 0.6$

∴ P(prepared) * P(study) = 0.684 × 0.6 = 0.4104.

∴ P(prepared ∩ study) ≠ P(prepared) * P(study)

∴ prepared is not independent of study

Exercise 3 :

Let's denote   Smart = Sm

              prepared = P.

              Study = St.

$$P(Sm \cap P \mid St) = \frac{P(Sm \cap P \cap St)}{P(St)}$$

$$= \frac{0.432}{0.6}$$

$$= 0.72$$

$$P(Sm \mid St) = \frac{P(Sm \cap St)}{P(St)}$$

$$= \frac{0.48}{0.6} = 0.8$$

$$P(P \mid St) = \frac{P(P \cap St)}{P(St}$$

$$= \frac{0.516}{0.6} = 0.86$$

$\therefore P(sm|st) \times P(P|st) = 0.8 \times 0.86$

$$= 0.688$$

$\therefore P(sm \cap p|st) \neq P(sm|st) \times P(P|st)$

$\therefore$ Study is

$\therefore$ Smart is not conditionally independent of prepared given study.

$\rightarrow$ Is study conditionally independent of prepared given smart?

$P(st \cap P | sm) = \dfrac{P(st \cap P \cap sm)}{P(sm)}$

$$= \dfrac{0.432}{0.8}$$

$$= 0.54$$

$P(st|sm) = \dfrac{P(st \cap sm)}{P(sm)}$

$$= \dfrac{0.48}{0.8} = 0.6$$

$$P(P|Sm) = \frac{P(P \cap Sm)}{P(Sm)}$$

$$= \frac{0.592}{0.8} = 0.74$$

$\therefore$ $P(St|Sm) * P(P|Sm) = 0.6 \times 0.74$

$$= 0.444$$

$\therefore$ $P(St \cap P |Sm) \neq P(St|Sm) * P(P|Sm)$

$\therefore$ Study is not conditionally independent of prepared.
given smart.

Guilty or not?

Let,
crime $= C$, Guilty $= G$

$P(C) = 0.008$, $P(G|C) = 0.98$

$P(G'|C') = 0.97$, $P(G|C') = 0.03$

$P(G'|C) = 0.02$

$P(C|G) = ?$ $P(C'|G) = ?$

$$P(C|G) = \frac{P(G|C) * P(C)}{P(G)} \quad \text{—(i)}$$

$$P(C'|G) = \frac{P(G|C') \, P(C')}{P(G)} \quad \text{—(ii)}$$

① ÷ ①

$$\frac{P(c|a)}{P(c'|a)} = \frac{P(a|c) * P(c)}{P(a|c') * P(e)} = 8 \cdot \frac{P(a|c) * P(c)}{P(a|c') * P(e)}$$

$$= \frac{14.90 \times 2.0}{189}$$

$$189 \, P(c|a) = 49 \, P(c'|a)$$

$$P(c'|a) = \frac{189}{49} \, P(c|a)$$

$$\therefore \frac{P(c'|a)}{P(c|a)} = \frac{189}{49}$$

$$\therefore P(c'|a) > P(c|a)$$

∴ the person is more likely to not be a criminal.