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Tutorial-7

q2.

→ ↑ travel → ↑ probability of fraud.

→ ↑ Foreign purchase → ↑ fraud.

→ ↑ travel & fraud → ↑ Foreign purchase.

q1. Classifying hidden variables.

$P(\text{fraud} = \text{true} \mid \text{for.p} = \text{true})$

$= \alpha * [P(f=\text{true}) \text{ travel}=\text{true}) * P(f.p=\text{true}) \text{ travel}=\text{true}, \text{fraud}=\text{true} * P(t=\text{true}) +$

$P(f=\text{true} \mid t=\text{false}) * P(f.p=\text{true}), t=\text{false}, f=\text{true}) * P(t=\text{false})]$

$= \alpha * [0.00045 + 0.00019]$

$= 0.00064\alpha$

$P(\text{fraud} = \text{False} \mid f.p = \text{true})$

$= \alpha * [P(f=\text{false} \mid t=\text{true}) * P(f.p=\text{true} \mid t=\text{true}, f=\text{false} * P(t=\text{true})] +$

$P(f=\text{false} \mid t=\text{false}) * P(f.p=\text{true} \mid t=f, f=\text{false}) * P(t=\text{false})$

$= 0.054031\alpha$

$$\alpha = \frac{1}{\alpha_1 + \alpha_2} = 18.291$$

$$P(\text{fraud} = \text{true} \mid \text{f.p} = \text{true}) = 0.00064\alpha$$

$$= \underline{1.17\%}$$

Q2. $P(\text{fraud} = \text{true} \mid \text{f.p} = \text{true}, \text{travel} = \text{true})$

$$= \alpha \cdot 0.00045$$

$$P(\text{f} = \text{false} \mid \text{f.p} = \text{true}, \text{t} = \text{true})$$

$$\alpha = \alpha * 0.04455$$

$$\alpha = \frac{1}{\alpha_1 + \alpha_2} = 22.222$$

$$P(\text{F} = \text{true} \mid \text{f.p} = \text{true}, \text{travel} = \text{true})$$

$$= 0.01$$

$$= 1\%$$