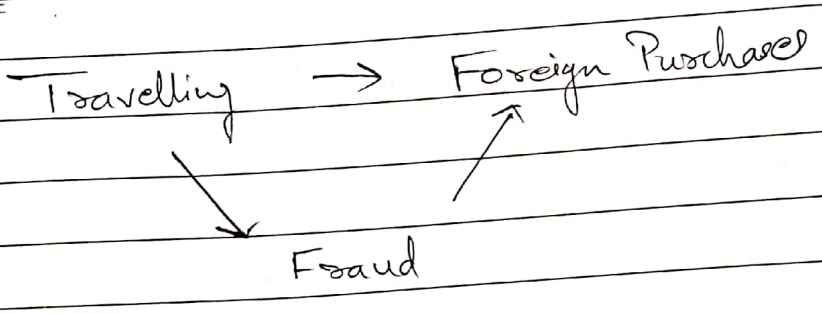
Tut 7 ML 2

Bayesian



⇒ Travel can cause fraud

⇒ Foreign purchase → evidence for fraud. because Increased probability of foreign purchase makes fraud more likely

⇒ Travelling & fraud ⇒ can cause foreign purchase.

True	False
0.05	0.95

Travel	True	False
True	0.01	0.99
False	0.002	0.998.

Travel	Fraud	True	False
True	True	0.90	0.10
False	True	0.10	0.90
True	False	0.90	0.10
False	False	0.01	0.99

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3) classify hidden variables

[travel = ? foreign purchase = True, fraud = ?]

P(Fraud = true | foreign purchase = true)

= α * [P(fraud = t | travel = true) * P(foreign purd = t | travel = true, fraud = true) * P(travel = true)
+
P(fraud = true | trave = false) * P(foreig purd = t | travel = false, fraud = true) * P (travel = false)]

= α * [0.01 * 0.90 * 0.05 + 0.002 * 0.10 * 0.95]

= α * [0.00045 + 0.00019]

= 0.00064 α

P(fraud = false | foreign purd = true)

= α * [0.99 * 0.90 * 0.05 + 0.998 * 0.01 * 0.95]

= α * [0.04455 + 0.009481]

= 0.054031 α

$\alpha = \frac{1}{0.00064 + 0.054031} = 18.291$

P(fraud = true | foreign pur = t) = 0.00064 α = 0.01170

P(fraud = true | foreign pur = t) = 1.17 %.

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$P(\text{fraud} = t \mid \text{forei purch} = t, \text{travel} = \text{true})$

$= \alpha * 0.00045$

$P(\text{fraud} = \text{false} \mid \text{foreig purch} = \text{true}, \text{travel} = \text{true})$

$= \alpha * 0.04455$

$\therefore \alpha = \frac{1}{0.00645 + 0.04455} = 22.222$

$P(\text{fraud} = \text{true} \mid \text{foreign purch} = \text{true}, \text{trave} = t)$

$= 2 \times 0.00045$

$= 22.222 \times 0.00045 = 0.01$

$\therefore P(\text{fraud} = t \mid \text{foreig pur} = \text{tru} \mid \text{travel} = \text{tru}) = 1\%$