09/09/2020

Assignment - 1 CSE-576-NLP

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① $P\left(\frac{A}{G}\right) = P\left(\frac{A,E}{G}\right) + P\left(\frac{A,\bar{E}}{G}\right)$

$= P\left(\frac{A}{E,G}\right) P\left(\frac{E}{G}\right) + P\left(\frac{A}{\bar{E},G}\right) P\left(\frac{\bar{E}}{G}\right)$

$= P\left(\frac{A}{E,G}\right) \cdot P(E) + P\left(\frac{A}{\bar{E},G}\right) P(\bar{E})$

$= (0.5)(10^{-4}) + (0.99)(0.9999)$

$= 0.00005 + 0.989901$

$= \boxed{0.989951}$ // Ans

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② $P\left(\frac{G}{A}\right) = \frac{P\left(\frac{A}{G}\right) P(G) - ②}{P(A) - ③}$ (① above)

$\Rightarrow P(A) = P(A,E,G) + P(A,E,\sim G) + P(A,\sim E,G) + P(A,\sim E,\sim G)$

$\Rightarrow P\left(\frac{A}{E,G}\right) P(E,G) + P\left(\frac{A}{E,\sim G}\right) P(E,\sim G) + P\left(\frac{A}{\sim E,G}\right) P(\sim E,G) + P\left(\frac{A}{\sim G,\sim G}\right) P(\sim G,\sim G)$

$\Rightarrow P\left(\frac{A}{E,G}\right) P(E) P(G) + P\left(\frac{A}{E,\sim G}\right) P(E) P(\sim G) + P\left(\frac{A}{\sim G,G}\right) P(\sim G) P(G) + P\left(\frac{A}{\sim G,\sim G}\right) P(\sim G) P(\sim G)$

$\Rightarrow (0.5)(10^{-4})(10^{-1}) + (0.85)(10^{-4})(0.9) + (0.99)(0.9999)(0.1) + (10^{-4})(0.9999)(0.9)$

$\Rightarrow$

$$\Rightarrow 5\times10^{-6} + (85)(9)(10^{-7}) + (99)(9999)(10^{-7}) + (9999)(9)(10^{-9})$$

$$\Rightarrow 0.099161591 \quad -③$$

$$P\left(\frac{G}{A}\right) = \frac{P\left(\frac{A}{G}\right)^{①} P(G)}{P(A) \rightarrow ③}$$

$$= \frac{0.989951 \times 0.1}{0.0991659}$$

$$= \boxed{0.9983210 \text{ // Ans.}}$$

(3) $$P\left(\frac{S}{A}\right) = P\left(\frac{S, E}{A}\right) + P\left(\frac{S, \sim E}{A}\right)$$

$$= P\left(\frac{S}{G,A}\right) P\left(\frac{E}{A}\right) + P\left(\frac{S}{\sim E, A}\right) P\left(\frac{\sim E}{A}\right)$$

$$= P\left(\frac{S}{E}\right) P\left(\frac{E}{A}\right) + P\left(\frac{S}{\sim E}\right) P\left(\frac{\sim E}{A}\right) \quad -$$

$$P\left(\frac{E}{A}\right) = \frac{P\left(\frac{A}{E}\right)^{①} P(E)}{P(A)}$$

$$P\left(\frac{A}{E}\right) = P\left(\frac{A, G}{E}\right) + P\left(\frac{A, \sim G}{E}\right)$$

$$\Rightarrow P\left(\frac{A}{G,E}\right) P(G) + P\left(\frac{A}{\sim G,E}\right) P(\sim G)$$

$$\Rightarrow (0.5)(0.1) + (0.85)(0.9)$$

$$\Rightarrow 0.815$$

$$P\left(\frac{E}{A}\right) = \frac{P\left(\frac{A}{E}\right) P(E)}{P(A)}$$

$$= \frac{(0.815)(10^{-4})}{0.09916159}$$

$$= 0.000822$$

$P\left(\frac{\sim E}{A}\right) = P\left(\frac{A}{\sim E}\right)$ =

Substituting in equation – (4)

$$(0.8)(0.00822) + (0.1)$$

$$P\left(\frac{\sim G}{A}\right) = \frac{P\left(\frac{A}{\sim E}\right) P(\sim E)}{P(A)} \quad (2)$$

$$P\left(\frac{A}{\sim E}\right) = P\left(\frac{A,G}{\sim E}\right) + P\left(\frac{A,\sim G}{\sim E}\right)$$

$$= P\left(\frac{A}{G,\sim E}\right) P(G) + P\left(\frac{A}{\sim G,\sim E}\right) P(\sim G)$$

$= (0.99)(0.1) + (10^{-4})(0.9)$

$= 0.09909$

$P\left(\frac{\sim E}{A}\right) = \frac{0.09909 \times 0.9999}{0.09916159}$

$= \frac{0.09908}{0.09916159}$

$= 0.99918$ // Ans.

$\Rightarrow P\left(\frac{S}{C}\right) P\left(\frac{C}{A}\right) + P\left(\frac{S}{\sim E}\right) P\left(\frac{\sim E}{A}\right)$

$\Rightarrow (0.8)(0.000822) + (0.1)(0.99918)$

$\Rightarrow 0.0006576 + 0.099918 =$

$\Rightarrow$ ~~0.106494~~ 0.1005756