AI1103-Assignment-3

Name: Vikhyath Sai Kothamasu, Roll Number: CS20BTECH11056

Download all python codes from

https://github.com/Vikhyath−vec/AI1103/tree/main/Assignment−3/codes

and latex-tikz codes from

https://github.com/Vikhyath−vec/AI1103/blob/main/Assignment−3/Assignment−3.tex

Question

A screening test is carried out to detect a certain disease. It is found that 12% of the positive reports and 15% of the negative reports are incorrect. Assuming that the probability of a person getting positive report is 0.01, the probability that a person tested gets an incorrect report is

Solution

Let $X \in \{0, 1\}$ represent the random variable, where 0 represents the case where a person gets a positive report while 1 represents the case where a person gets a negative report. From the question,

$$\Pr(X = 0) = 0.01 \tag{0.0.1}$$

$$\Pr(X = 0) + \Pr(X = 1) = 1 \tag{0.0.2}$$

$$\Pr(X = 1) = 1 - 0.01 = 0.99 \tag{0.0.3}$$

Let $Y \in \{0, 1\}$ represent the random variable, where 0 represents a correct report whereas 1 represents an incorrect report.

$$\Pr(Y = 1|X = 0) = 12\% = 0.12 \tag{0.0.4}$$

$$\Pr(Y = 1|X = 1) = 15\% = 0.15 \tag{0.0.5}$$

Then, from total probability theorem,

$$\Pr(Y = 1) = \Pr(Y = 1, X = 0) + \Pr(Y = 1, X = 1) \tag{0.0.6}$$

Using Bayes theorem,

$$\Pr(Y = 1) = \Pr(Y = 1|X = 0) \times \Pr(X = 0) + \Pr(Y = 1|X = 1) \times \Pr(X = 1) \tag{0.0.7}$$

$$\Pr(Y = 1) = 0.12 \times 0.01 + 0.15 \times 0.99 \tag{0.0.8}$$

$$= 0.0012 + 0.1485 \tag{0.0.9}$$

$$= 0.1497 \tag{0.0.10}$$