Assignment 1

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Download all python codes from

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and latex-tikz codes from

https://www.overleaf.com/read/syhjtdyqhryr

1 Problem 2.9

A laboratory blood test 99 % effective in detecting a certain disease when it is in fact , present. However, the test also yields a false positive result for 0.5% of the healthy person tested (i.e, I'd a Hindi person is tested, then, which probability 0.005 the test will imply he has the disease). If 0.1% the probability that a person has the disease given that his test result is positive?

2 Solution:

Let
A : Person has the disease.
B : Person does not have disease.
C : Test result is positive.
We need to find the probability that a person has the disease given the test result is positive.
i.e, $\Pr(A \mid C)$

$$= \frac{\Pr(A) \times \Pr(C \mid A)}{(\Pr(B) \times \Pr(C \mid B)) + (\Pr(A) \times \Pr(C \mid A))} \tag{2.0.1}$$

Probability that person has disease.

$$= 0.1\% = 0.001 \tag{2.0.2}$$

$\Pr(C|A)$ =Probability that test result is positive ,if the person has the disease.

$$= 99\% = 0.99 \tag{2.0.3}$$

$\Pr(B)$=Probability that person does not have disease.

$$= 99.9\% = 0.999 \tag{2.0.4}$$

$\Pr(C|A)$ =Probability that test result is positive ,if the person does not have the disease is given

$$= 0.005 \tag{2.0.5}$$

Substituting values in equation (2) $\Pr(A \mid C)$

$$= \frac{0.001 \times 0.99}{0.999 \times 0.005 + 0.001 \times 0.99} = \frac{22}{133} \tag{2.0.6}$$

required probability is $\frac{22}{133}$