# AI5002: Assignment 3

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Download all latex-tikz codes from

https://github.com/Debolena/AI5002−Probability−and−Random−Variables/tree/main/Assignment_3

## 1 Problem

Assume that the chances of a patient having a heart attack is 40%. It is also assumed that a meditation and yoga course reduce the risk of heart attack by 30% and prescription of certain drug reduces its chances by 25%. At a time a patient can choose any one of the two options with equal probabilities. It is given that after going through one of the two options the patient selected at random suffers a heart attack. Find the probability that the patient followed a course of meditation and yoga?

## 2 Solution

Let A be the event denoting that the patient will have an heart attack.
Then, P($A$) = $\frac{40}{100} = \frac{4}{10}$
Let $B_1$ be the event that the patient does yoga and meditation.
Let $B_2$ be the event that the patient uses prescripted drugs.
Since the patient can choose only one option at a time.

$$\therefore P(B_1) = P(B_2) = \frac{1}{2} \tag{2.0.1}$$

Also, according to the question,

$$P(A|B_1) = \frac{40}{100} - \left(\frac{30}{100}\right)\left(\frac{40}{100}\right) \tag{2.0.2}$$

$$= \frac{28}{100} \tag{2.0.3}$$

$$P(A|B_2) = \frac{40}{100} - \left(\frac{25}{100}\right)\left(\frac{40}{100}\right) \tag{2.0.4}$$

$$= \frac{30}{100} \tag{2.0.5}$$

Using Bayes Theorem, given that the patient suffers from heart attack, the probability that the patient followed the course of meditation and yoga is

$$= P(B_1|A) \tag{2.0.6}$$

$$= \frac{P(A|B_1).P(B_1)}{P(A|B_1).P(B_1) + P(A|B_2).P(B_2)} \tag{2.0.7}$$

$$= \frac{\frac{28}{100}\cdot\frac{1}{2}}{\frac{28}{100}\cdot\frac{1}{2} + \frac{30}{100}\cdot\frac{1}{2}} \tag{2.0.8}$$

$$= \frac{28}{28+30} \tag{2.0.9}$$

$$= \frac{14}{29} \tag{2.0.10}$$