

# Assignment 1

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Download all python codes from

<https://github.com/GauthamBellamkonda/AI1103/tree/main/Assignment1/Codes>

and latex codes from

<https://github.com/GauthamBellamkonda/AI1103/tree/main/Assignment1>

## PROBLEM

(Prob 2.3) Assume that the chances of a patient having a heart attack is 40%. It is also assumed that a meditation and yoga course reduces 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?

## SOLUTION

Let  $H \in \{0, 1\}$  denote the random variable of the patient having a heart attack,  $A \in \{0, 1\}$  denote the random variable of the patient taking a meditation and yoga course, or the patient taking the drug. Given that,

$$\Pr(H = 1) = 0.4$$

$$\Pr(A = 0) = \Pr(A = 1)$$

$$\begin{aligned}\Pr(H = 1|A = 0) &= \Pr(H = 1)(1 - 0.30) \\ &= 0.28\end{aligned}$$

$$\begin{aligned}\Pr(H = 1|A = 1) &= \Pr(H = 1)(1 - 0.25) \\ &= 0.3\end{aligned}$$

Therefore, by Bayes' Theorem

$$\begin{aligned}\Pr(A = 0|H = 1) &= \frac{\Pr(H = 1|A = 0) \Pr(A = 0)}{\sum_{i=0}^1 \Pr(H = 1|A = i) \Pr(A = i)}\end{aligned}$$

We can cancel  $\Pr(A = 1)$  and  $\Pr(A = 0)$  from the numerator and denominator as they are given to be equal.

$$\begin{aligned}\therefore \Pr(A = 0|H = 1) &= \frac{\Pr(H = 1|A = 0)}{\Pr(H = 1|A = 0) + \Pr(H = 1|A = 1)} \\ &= \frac{0.28}{0.28 + 0.3} \\ &= \frac{0.28}{0.58} \\ &= \frac{14}{29} \\ &\approx 0.48275862069\end{aligned}$$

Therefore, the probability that the patient followed a course of meditation and yoga, given that he suffers a heart attack is 0.48275862069