Assignment 1

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Download all python codes from
https://github.com/Gautham-Bellamkonda/AI1103-Probability-and-Random-Variables/tree/main/Assignment1/Codes
and latex codes from
https://github.com/Gautham-Bellamkonda/AI1103-Probability-and-Random-Variables/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 twp 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 denote the chances of the patient having a heart attack, Y denote that the patient takes a meditation and yoga course, and D denote that the patient takes the drug.
Given that,

$$\begin{aligned}\Pr(H) &= 0.4\\ \Pr(Y) &= \Pr(D)\\ \Pr(H|Y) &= \Pr(H)\,(1-0.30)\\ &= 0.28\\ \Pr(H|D) &= \Pr(H)\,(1-0.25)\\ &= 0.3\end{aligned}$$

Therefore, by Bayes' Theorem

$$\Pr(Y|H) = \frac{\Pr(H|Y)\Pr(Y)}{\Pr(H|Y)\Pr(Y)+\Pr(H|D)\Pr(D)}$$

We can cancel $\Pr(D)$ and $\Pr(Y)$ from the numerator and denominator as they are given to be equal.

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

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