Assignment 2 -Probability and Random Variable

seshikanth CS21RESCH01001

Problem Statement prob 2.4-Suppose that 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random. What is the probability of this person being male? Assume that there are equal number of males and females.

Solutions:

Say there are 100 people. Half of them men and half of them women. 5% of men have grey hair(2.5 men) and 0.25% of women have grey hair(0.125 women)

	Men	**Women**	**Total**
	50	50	100
Greyhair	2.5	0.125	

Required probability = how many of men have grey hair = $\frac{\textbf{Men with grey hair}}{\textbf{total grey haired persons}}$

$= \frac{2.5}{2.5+0.125}$

$= \frac{2.5}{2.625}$

$=$ **0.95238**

Another way using Bayes theorem:

M - number of men, W = number of women , G = number of grey persons $P(M) = 0.5 = P(W)$

$P(G|M) = 0.05$

$P(G|W) = 0.0025$

$P(M|G)$ **is what we need to find**

By bayes theorem,

$$\begin{aligned} P(M|G) &= \frac{P(M,G)}{P(G)} \\ &= \frac{P(G|M)P(M)}{P(G)} \\ &= \frac{P(G|M)P(M)}{P(G|M)P(M) + P(G|W)P(W)} \\ &= \frac{0.05 * 0.5}{0.05 * 0.5 + 0.0025 * 0.5} \\ &= \frac{0.025}{0.02625} \\ &= \textbf{0.95238} \end{aligned}$$