Assignment 1

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Download all python codes from

https://github.com/PRANAV−CPU/ai1103_Probability_and_Random_variables/blob/main/Assignment_1/codes/experimental_verification_2.4.py

and latex-tikz codes from

https://github.com/PRANAV−CPU/ai1103_Probability_and_Random_variables/blob/main/Assignment_1/main.tex

1 Problem

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.

2 Solution

Let A=0,1 represent the random variable for being male or female and G=0,1 represent having grey hair or not.Then,

$$P(A = 0) = 50\% = 0.5 \tag{2.0.1}$$

$$P(A = 1) = 50\% == 0.5 \tag{2.0.2}$$

$$P(G = 1|A = 0) = 5\% = 0.05 \tag{2.0.3}$$

$$P(G = 1|A = 1) = 0.25\% = 0.0025 \tag{2.0.4}$$

By Bayes rules,

$$P(A = 0|G = 1) = \frac{P(A = 0) \times P(G = 1|A = 0)}{P(A = 0) \times P(G = 1|A = 0) + P(A = 1) \times P(G = 1|A = 1)} \tag{2.0.5}$$

$$P(A = 0|G = 1) = \frac{0.5 \times 0.05}{0.5 \times 0.05 + 0.5 \times 0.0025} \tag{2.0.6}$$

$$P(A = 0|G = 1) = 0.952380952 \tag{2.0.7}$$

Probability that the grey haired person selected at random is male is approximately 0.95.