

Assignment 1

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Download all python codes from

[https://github.com/pranav-159/
ai1103_Probability_and_Random_variables/
blob/main/Assignment_1/codes/
experimental_verification_2.4.py](https://github.com/pranav-159/ai1103_Probability_and_Random_variables/blob/main/Assignment_1/codes/experimental_verification_2.4.py)

and latex-tikz codes from

[https://github.com/pranav-159/
ai1103_Probability_and_Random_variables/
blob/main/Assignment_1/main.tex](https://github.com/pranav-159/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,

$$P(A = 0) = 50\% = 0.5 \quad (2.0.1)$$

$$P(A = 1) = 50\% = 0.5 \quad (2.0.2)$$

$$P(G = 1|A = 0) = 5\% = 0.05 \quad (2.0.3)$$

$$P(G = 1|A = 1) = 0.25\% = 0.0025 \quad (2.0.4)$$

By Bayes rules,

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

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

$$P(A = 0|G = 1) = 0.952380952 \quad (2.0.7)$$

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