7-11-2023

Tema #2

Ex #4

a) B = „Sunt bolnav de Covid"

t_1 = „Testul 1 e pozitiv"

t_2 = „Testul 2 e pozitiv"

Am obținut un test pozitiv și unul negativ $\Rightarrow$ Trebuie calculat $\mathbb{P}(B \mid t_1 \cap t_2^c)$

$$\mathbb{P}(B \mid t_1 \cap t_2^c) = \frac{\mathbb{P}(B) \cdot \mathbb{P}(t_1 \cap t_2^c \mid B)}{\mathbb{P}(B) \cdot \mathbb{P}(t_1 \cap t_2^c \mid B) + \mathbb{P}(B^c) \cdot \mathbb{P}(t_1 \cap t_2^c \mid B^c)} =$$

$$= \frac{\mathbb{P}(B) \cdot \mathbb{P}(t_1 \mid B) \cdot \mathbb{P}(t_2^c \mid B)}{\mathbb{P}(B) \cdot \mathbb{P}(t_1 \mid B) \cdot \mathbb{P}(t_2^c \mid B) + \mathbb{P}(B^c) \cdot \mathbb{P}(t_1 \mid B^c) \cdot \mathbb{P}(t_2^c \mid B^c)}$$

$$= \frac{\frac{1}{1000} \cdot \frac{98}{100} \cdot \frac{2}{100}}{\frac{1}{1000} \cdot \frac{98}{100} \cdot \frac{2}{100} + \frac{999}{1000} \cdot \frac{5}{100} \cdot \frac{95}{100}} \quad (\cdot 1000 \cdot 100 \cdot 100) =$$

$$= \frac{196}{196 + 474525} = \frac{196}{474721} = 0.000412 = 0,0412\%$$

b) $\mathbb{P}(B^c \mid t_1^c \cap t_2^c) = \frac{\mathbb{P}(B^c) \cdot \mathbb{P}(t_1^c \cap t_2^c \mid B^c)}{\mathbb{P}(B^c) \cdot \mathbb{P}(t_1^c \cap t_2^c \mid B^c) + \mathbb{P}(B) \cdot \mathbb{P}(t_1^c \cap t_2^c \mid B^c)} =$

$$= \frac{\mathbb{P}(B^c) \cdot \mathbb{P}(t_1^c \mid B^c) \cdot \mathbb{P}(t_2^c \mid B^c)}{\mathbb{P}(B^c) \cdot \mathbb{P}(t_1^c \mid B^c) \cdot \mathbb{P}(t_2^c \mid B^c) + \mathbb{P}(B) \cdot \mathbb{P}(t_1^c \mid B) \cdot \mathbb{P}(t_2^c \mid B)} =$$

$$= \frac{\frac{999}{1000} \cdot \frac{95}{100} \cdot \frac{95}{100}}{\frac{999}{1000} \cdot \frac{95}{100} \cdot \frac{95}{100} + \frac{1}{1000} \cdot \frac{2}{100} \cdot \frac{2}{100}} \quad (\cdot 1000 \cdot 100 \cdot 100) = \frac{9015975}{9015975 + 4} =$$

$$= 0,9999 = 99,99\%$$