Assignment 3 1.1 Diagnosis

$T \Rightarrow$ test positive ; $\bar{T} \Rightarrow$ test negative | $C \Rightarrow$ has covid ; $\bar{C} \Rightarrow$ not covid

$P(T \mid C) = 0,89$ — pos. test given you have the disease

$P(\bar{T} \mid \bar{C}) = 0,89$ — neg. test given you don't have the disease

$$P(C) = \frac{1}{6560} = 0,00015 \leftarrow \boxed{\text{chance of having covid}}$$

is then $\Rightarrow P(\bar{C}) = 1 - 0,00015 = 0,99985$

Using Bayes' theorem:

$$P(C \mid T) = \frac{P(T \mid C) \cdot P(C)}{P(T)}$$

What we want to compute

Missing, must compute this

Using rule of sum:

I. $P(T) = P(T \cap C) + P(T \cap \bar{C})$

II. $P(T \cap C) = P(T \mid C) \cdot P(C) = 0,89 \cdot 0,00015 = 0,00013$

III. $P(T \cap \bar{C}) = P(T \mid \bar{C}) \cdot P(\bar{C})$

III $P(T \mid \bar{C}) = 1 - P(\bar{T} \mid \bar{C}) = 1 - 0,89 = 0,11$

III $P(T \cap \bar{C}) = 0,11 \cdot 0,99985 = 0,10998$

I $P(T) = 0,00013 + 0,10998 = 0,11011$

$$P(C \mid T) = \frac{0,89 \cdot 0,00015}{0,11011} = 0,00121$$

Chance of having the disease is 0.00121

1.2

$P(\text{Covid}=1) = \frac{1}{275}$

violate twice $= \frac{1}{275} + \frac{1}{275}$

$= \frac{2}{275}$

100 times $= \frac{100}{275}$

1.3

$T \Rightarrow$ test pos & $\bar{T} \Rightarrow$ test neg | $W \Rightarrow$ has worms & $\bar{W} \Rightarrow$ no worms

$P(\bar{T}|W)=0$ $\quad P(T|W)=1,0$ $\quad P(\bar{T}|\bar{W})=0,97$

$P(T|\bar{W})=0,03$ $\quad P(W)=0,002$

Rule of sum

* $P(T) = P(T \cap W) + P(T \cap \bar{W})$

$P(T \cap W) = P(T|W) \cdot P(W) = 1,0 \cdot 0,002 = 0,002$

$P(T \cap \bar{W}) = P(T|\bar{W}) \cdot P(\bar{W}) = 0,03 \cdot 0,998 = 0,02994$

$P(T) = 0,002 + 0,02994 = 0,03194$

3,194% will test as having worms

* $P(W|T) = \dfrac{P(T|W) \cdot P(W)}{P(T)}$ Bayes theorem

$= \dfrac{1,0 \cdot 0,002}{0,03194}$

$P(W|T) = 0,06262$

3.194% of the fruits will test as having worms

Given that an apple has tested for worms, the probability that there is a worm inside is 0.06262