Worksheet 1 Group Task 6

Exercise 6 Application of the Bayes theorem

Given:

Diagnostic test with sensitivity $P[T^+|D^+] = 0.95$ and specificity $P[T^-|D^-] = 0.94$ Disease prevalence $P[D^+] = 0.001$

Question:

What is $P[D^-|T^+]$?

Solution:

Bayes:

$$P[A|B] = \frac{P[B|A] * P[A]}{P[B]}$$

Therefore:

$$P[D^-|T^+] = \frac{P[T^+|D^-] * P[D^-]}{P[T^+]}$$

$$P[T^+] = P[T^+|D^+] * P[D^+] + P[T^+|D^-] * P[D^-]$$

$$P[T^+|D^-] = 1 - P[T^-|D^-]$$

$$P[D^-] = 1 - P[D^+]$$

R code for calculation:

```
sens <- 0.95
spec <- 0.94
prev <- 0.001
pt <- sens*prev+(1-spec)*(1-prev)
(prob_dn_tp <- ((1-spec)*(1-prev))/pt)
```

```
## [1] 0.9843981
```