

BONUS TO TAKE-HOME
ASSIGNMENT #1
SEPTEMBER 21ST 2016
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201-922-DW

T_+ = TEST POSITIVE YES = HAS HIV
 T_- = TEST NEGATIVE NO = DOES NOT HAVE HIV

WE HAVE THE FOLLOWING:

$$\begin{array}{lll} P(\text{Yes}) = 0.259 & P(T_+ | \text{Yes}) = 0.997 & P(T_- | \text{No}) = 0.926 \\ P(\text{No}) = 0.741 & P(T_- | \text{Yes}) = 0.003 & P(T_+ | \text{No}) = 0.074 \end{array}$$

WE WANT TO COMPUTE $P(\text{Yes} | T_+)$

$$\begin{aligned} P(\text{Yes} | T_+) &= \frac{P(\text{Yes} \cap T_+)}{P(T_+)} \\ &= \frac{P(\text{Yes} \cap T_+)}{P(\text{Yes} \cap T_+) + P(\text{No} \cap T_+)} \\ &= \frac{P(T_+ | \text{Yes}) \cdot P(\text{Yes})}{P(T_+ | \text{Yes}) \cdot P(\text{Yes}) + P(T_+ | \text{No}) \cdot P(\text{No})} \\ &= \frac{(0.997)(0.259)}{(0.997)(0.259) + (0.074)(0.741)} \\ &= \frac{0.258223}{0.258223 + 0.054834} \\ &= \boxed{0.8248} \end{aligned}$$

IF A PERSON TESTS POSITIVE THERE IS AN 82.48% CHANCE HE/SHE HAS HIV.