ECS315 Quiz 1 Solution

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Data from fifteen testees are shown below.

D:	0	1	1	0	0	0	0	1	1	1	1	0	1	0	1
T_p:	1	0	0	1	1	0	0	0	0	0	1	1	0	1	1

$P(D \cap T_p) = \frac{2}{15}$

$P(D^c \cap T_p) = \frac{5}{15}$

(Assume the same definitions as those defined in class.)

$P(T_p|D) \equiv \frac{P(T_p \cap D)}{P(D)} = \frac{2/15}{8/15} = \frac{2}{8} = \frac{1}{4}$

Use the provided data to estimate the following probabilities:

Among the 15 testees, 8 of them have the disease

$P(D) \approx \boxed{\frac{8}{15}}$

$P(D^c) \approx \boxed{\frac{7}{15}}$

Among the 8 testees who have the disease, two are tested positive

$P(T_p|D) \approx \frac{2}{8} = \boxed{\frac{1}{4}}$

$P(T_p|D^c) \approx \boxed{\frac{5}{7}}$

$P(T_p^c|D) \approx \frac{6}{8} = \boxed{\frac{3}{4}}$

$P(T_p^c|D^c) \approx \boxed{\frac{2}{7}}$

$P(D|T_p) = \frac{2}{7}$

$P(T_p) \approx \boxed{\frac{7}{15}}$

$P(T_p^c) \approx \boxed{\frac{8}{15}}$

Note that ① $P(T_p) = P(T_p|D)P(D) + P(T_p|D^c)P(D^c)$ ← total probability theorem

② $P(D|T_p) = \frac{P(T_p|D)P(D)}{P(T_p)}$ ← Bayes' theorem