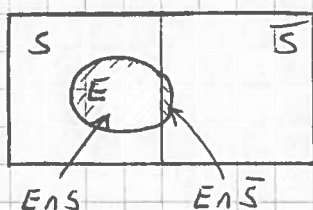


GA2 = Ebola Outbreak

Events: E : Patient has ebola
 S : Patient has symptoms

$$Pr(S) = Pr(\bar{S}) = 0.5$$

$$Pr(E \cap S) = 0.2 ; Pr(E \cap \bar{S}) = 0.01$$

$$1. \underline{Pr(E)} = Pr(E \cap S) + Pr(E \cap \bar{S}) = 0.2 + 0.01 = \underline{0.21}$$

$$2. \underline{Pr(\bar{S}|E)} = \frac{Pr(E \cap \bar{S})}{Pr(E)} = \frac{0.01}{0.21} = \underline{0.0476}$$

$$3. 10 \text{ patients} = 5 \times S + 5 \times \bar{S}$$

$$Pr(\geq 1 \times E) = 1 - Pr(0 \times E) = 1 - Pr(10 \times \bar{E}) = 1 - Pr(S \times \bar{E} | S) \cdot Pr(S \times \bar{E} | \bar{S}) = 1 - Pr(E | S)^5 \cdot Pr(E | \bar{S})^5$$

(unabh. handelser)

$$Pr(\bar{E} | S) = 1 - Pr(E | S) = 1 - \frac{Pr(E \cap S)}{Pr(S)} = 1 - \frac{0.2}{0.5} = 0.6$$

$$Pr(\bar{E} | \bar{S}) = 1 - Pr(E | \bar{S}) = 1 - \frac{Pr(E \cap \bar{S})}{Pr(\bar{S})} = 1 - \frac{0.01}{0.5} = 0.98$$

$$Pr(S \times \bar{E} | S) = Pr(\bar{E} | S)^5 = 0.6^5 = 0.07776$$

$$Pr(S \times \bar{E} | \bar{S}) = Pr(\bar{E} | \bar{S})^5 = 0.98^5 = 0.90392$$

$$Pr(10 \times \bar{E}) = Pr(S \times \bar{E} | S) \cdot Pr(S \times \bar{E} | \bar{S}) = 0.07776 \cdot 0.90392 = 0.0703$$

$$\underline{Pr(\geq 1 \times E)} = 1 - Pr(10 \times \bar{E}) = 1 - 0.0703 = \underline{0.9297} \approx 93\%$$

5. 1 has E: (100000000), (010000000), (001000000), ..., (000000001) with equal probability

(1) (2) (3) ... (10)

$$\text{Average number of tests: } \underline{\bar{N}} = 1 \cdot Pr(1) + 2 \cdot Pr(2) + 3 \cdot Pr(3) + \dots + 10 \cdot Pr(10) = \sum_{k=1}^{10} k \cdot Pr(k)$$

$$= \sum_{k=1}^{10} k \cdot \frac{1}{10} = \frac{1}{10} \cdot \frac{10 \cdot 11}{2} = \frac{11}{2} = \underline{5.5}$$

$$7. 2 \text{ out of } 10: \underline{N_2^{10}} = \binom{10}{2} = \frac{10!}{2!8!} = \frac{10 \cdot 9}{2} = \underline{45 \text{ combinations}} \quad (\text{non-ordered})$$

$$8. \underline{Pr(\text{select the } 2 \times E)} = \frac{N_{\text{success}}}{N_{\text{all}}} = \frac{1}{45} = \underline{0.022}$$

GA2: Ebola Outbreak

10. Number of new infected pr. day pr. infected: $p = 0.5$

Number of infected on day d : $N(d)$ ($N(1) = 10 \cdot \Pr(E) = 2.1$)

Number of infected on day $d+1$: $N(d+1) = p \cdot N(d) + N(d) = (p+1) \cdot N(d)$

Number of infected after x days: $N(1+x) = (p+1)^x \cdot N(1)$

Days to 100 infected: $N(1+x) = 1.5^x \cdot 2.1 = 100$

$$\Downarrow \underline{x = \frac{\ln(100/2.1)}{\ln(1.5)} = 9.53 \text{ days}}$$

Number of infected after 10 days: $N(1+10) = 1.5^{10} \cdot 2.1 = 121 \text{ persons}$

$$11. \Pr(\geq 100 \text{ persons infected after 10 days}) = \frac{N_{\geq 100}}{N_{\text{sim.}}}$$

Matlab: $N_{\text{sim.}}$ = Total number of simulations

$N_{\geq 100}$ = Number of simulations giving 100 or more infected after 10 days