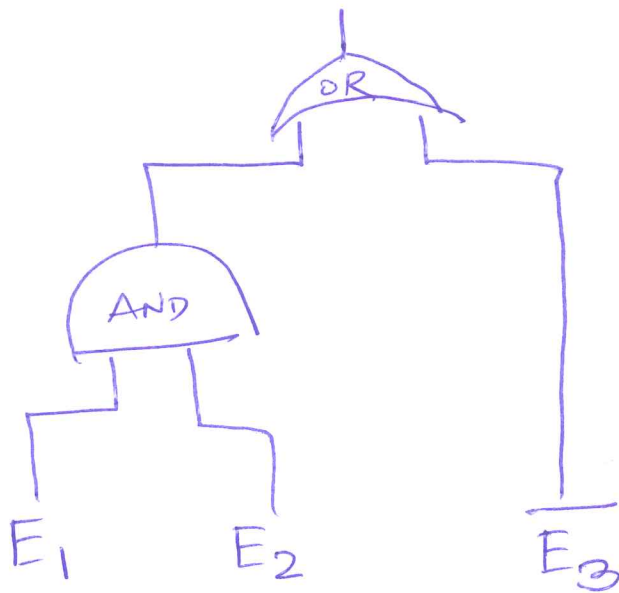


Fault tree



E_i : any event
in the system

System fails if

$(E_1 \text{ AND } E_2) \text{ OR } \overline{E_3}$ happens

Single point of failure: $\overline{E_3}$

Bernoulli trials

$$P(\text{Success}) = 0.9$$



transmissions till $P(\text{successful reception}) > 0.99$

$$\underbrace{0.9}_{\text{1st successful}} + \underbrace{0.1 * 0.9}_{FS} + \underbrace{0.1 * 0.1 * 0.9}_{FFS} = 0.999 > 0.99$$

\therefore I need 3 transmissions.

n trials

$P(\text{success in each trial}) = p.$

$$P(k \text{ successes in } n \text{ trials}) = C(n, k) * p^k * (1-p)^{n-k}$$

1 2 ... n
— — — —

TMR

$$R_{\text{TMR}} = P(2 \text{ successes in } 3 \text{ trials}) + P(3 \text{ successes in } 3 \text{ trials})$$

Generalized Bernoulli trials

Example

Request successful,	Request failed,	Request response delayed
0.8	0.05	0.15

3 requests, what is the probability that all 3 will be delayed.

$$C(3, 3) * (0.15)^3 * (0.85)^0$$
$$= (0.15)^3$$

Out of 10 requests, what is the probability that 5 will be successful, 4 will be delayed, and 1 will fail?

$$\frac{10!}{5! 4! 1!} * (0.8)^5 * (0.15)^4 * (0.05)^1$$

Tossing two coins

$$S = \{HH, HT, TH, TT\}$$

$$X: \begin{array}{cccc} \downarrow & \downarrow & \downarrow & \downarrow \\ \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} \end{array}$$