Bayes' Rule

\[
P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{P(B) \times P(A|B)}{\sum_i P(B_i) \times P(A|B_i)}
\]

#3

Reliability of THR

\[
R_{THR} = P(\text{All 3 components work}) + P(\text{Exactly 2 components work})
= R^3 + C(3,1) \times R^2 \times (1-R)
= R^3 + 3 \times R^2 \times (1-R)
= 3R^2 - 2R^3
\]

\[R_{THR} > R_{simplex}, \text{ if } R = 1, \text{ } R = 0.5, \text{ } R = 0\]
\[R_{THR} < R_{simplex}, \text{ if } R \in (0.5,1)\]
\[R_{THR} < R_{simplex}, \text{ if } R \in (0,0.5)\]
#1  \[
\text{Pr (Apache ws working)} = 0.95
\]
\[
\text{Pr (Nginx working)} = 0.97
\]
\[
\text{Pr (Apache ws fails | Nginx failed)} = 1.2 \times 0.05 = 0.06
\]
\[
\text{Pr (Nginx fails | Apache ws failed)} = 1.2 \times 0.03 = 0.036
\]
\[
\text{Pr (Application works)} = (1 - \text{Pr (Apache ws fails | Nginx fails)})
\]
\[
= 1 - \text{Pr (Apache ws fails)} \times \text{Pr (Nginx fails | Apache ws fails)}
\]
\[
= 1 - 0.05 \times 0.036 = 0.9982
\]

Pr (Application works if failures are independent)
\[
= 1 - \text{Pr (Apache ws fails)} \times \text{Pr (Nginx fails)}
\]
\[
= 1 - 0.05 \times 0.03 = 0.9985
\]

#2
\[
\text{Pr (System will fail)} = \text{Pr (E1)} \times \text{Pr (sys fail | E1)} + \text{Pr (E2)} \times \text{Pr (sys fail | E2)}
\]
\[
= 0.3 \times 0.05 + 0.4 \times 0.1 = 0.055
\]
Reliability of system = 0.945
Reliability Block Diagram

\[ R_c \]

\[ R_{sys} = \left[ 1 - (1 - R_c)^3 \right] \times \left[ 1 - (1 - R_{mem})^2 \right] \]