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\[ A_1, \ldots, A_n \rightarrow B \]

Noisy OR

\( \text{justified} \)

\[ \text{assume independence of causal influence} \]

\[ A_1, \ldots, A_n \rightarrow \text{STA} \leftarrow B \]

The original

\[ P(B | A_i) \]

\( \text{(logistic)} \)

\[ \text{OR} \]

\[ P(B | \ldots) = 0 \text{ iff } \ldots \text{ are all } \]
D-separation implies independence:

if $A$ and $B$ are $d$-separated, then

$A$ and $B$ are independent.

But, independence does not imply $d$-separation:

$A$ and $B$ may be independent even if they are $d$-connected.
Example

\[ A = (0.5, 0.5) \]

\[
\begin{array}{c|cc}
A & y & h \\
\hline
y & 0.5 & 0.5 \\
0.5 & 0.5 & 0.5 \\
\end{array}
\]

\[ P(A, B) = 0.25, P(A) = 0.5, P(B) = 0.5 \]

Clearly, \( P(A, B) = P(A)P(B) \), i.e., \( A \) and \( B \) are independent.

But, \( A \) and \( B \) are not independent.
This joint probability could be represented by this BN.

\[ P(A) = (0.5, 0.5) \]

\[ P(B) = (0.5, 0.5) \]
Intervention on a variable corresponds to creating a new DAG in which the edges into the variable are removed.

(The excision semantic for BNs)
Mary Calls?

John Calls?

Alarm?

Burglary?

Earthquake?

The excision semantics only works in causal Bayesian networks.
The "strength" of the intervention is \( P(\text{Intervene | John calls}) \).
Hey Fever?  
*Sneezing?*  
Hey, a Cold?  
*Perfect sneezy powder*  
Wiping One's Nose?