Bayesian Network

Independence

> An event is said to be **independent** if it is not affected by other events

$\perp$ denotes independence

If 2 variables are independent

$P(x, y) = P(x) \cdot P(y)$ direct multiply (no product rule)

The Joint Distribution of Independent Variables can be obtained by multiplying their Marginal Distribution

Conditonality of Independent Variables

Propeties (IFF Independent)

- $P(x|y) = P(x)$
- $P(y|x) = P(y)$

Simplifying Joint Distributions (Using $\perp$)

Results in less entries in the joint, can split the independent vars into their own tables.

Conditonal Independence

Unconditional Independence is rare; Focus on **conditional independence**

2 dependent variables **can become independent** when

- When other variables are taken into account
- At least 3 variables involved

- If X is conditionally independent of Y given Z

$$X \perp Y \mid Z$$

the following rules applies:

$$\boxed{P(X, Y \mid Z) = P(X \mid Z)\, P(Y \mid Z)}$$

$$\boxed{P(X \mid Y, Z) = P(X \mid Z)}$$

$$\boxed{P(Y \mid X, Z) = P(Y \mid Z)}$$