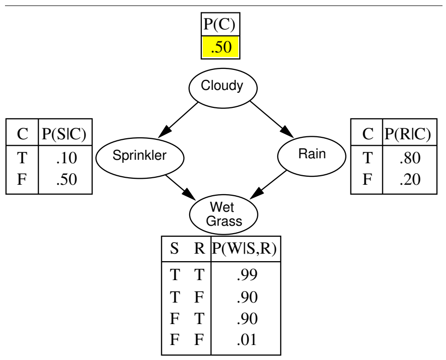
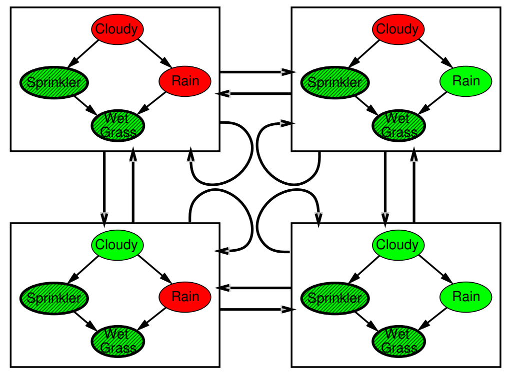
CS5811 handout
The procedure to obtain the sampling distributions for MCMC





The probability of a variable given its Markov blanket is proportional to the probability of the variable given its parents times the probability of each child given its respective parents:

$$P(x_i'|mb(X_i)) = \alpha P(x_i'|parents(X_i) \times \prod_{Y_j \in children(X_i)} P(y_j|parents(Y_j))$$

Consider the query $\mathbf{P}\ (R|S, W)$. S is true from the evidence. Suppose that R is true in the state.

The Markov blanket of C is its parents ($\emptyset$), its children ($\{R, S\}$), and the other parents of its children ($\emptyset$). We use the following distributions to sample C.

$\mathbf{P}\ (C|MB(C)) = \mathbf{P}\ (C|R, S) = \alpha\ \mathbf{P}\ (C)\ \mathbf{P}\ (S|C)\ \mathbf{P}\ (R|C)$
$= \alpha < 0.5, 0.5 > < 0.1, 0.5 > < 0.8, 0.2 >$
$= \alpha < 0.04, 0.05 >$
$=< \frac{4}{9}, \frac{5}{9} >$

For the states where R is false, $\mathbf{P}\ (C|\neg R, S)$ is calculated similarly .

The Markov blanket of R is its parents ($\{C\}$), its children ($\{W\}$), and the other parents of its children ($\{S\}$). We use the following distributions to sample R.

$\mathbf{P}\ (R|MB(R)) = \mathbf{P}\ (R|C, S, W) = \alpha\ \mathbf{P}\ (R|C)\ \mathbf{P}\ (W|R, S)$
$= \alpha < 0.8, 0.2 > < 0.99, 0.90 >$
$= \alpha < 0.792, 0.18 >$
$= \alpha < \frac{0.792}{0.972}, \frac{0.18}{0.972} > < \frac{22}{27}, \frac{5}{27} >$

$\mathbf{P}\ (R|\neg C, S, W)$ is calculated similarly.