15 minute quiz at the beginning of class.
The Markov chain

With $Sprinkler = true$, $WetGrass = true$, there are four states:

Wander about for a while, average what you see
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 \( P(R | S = t, W = t) \).
\( S \) is true from the evidence. Suppose that \( R \) is true in the state.
We will be sampling for \( C \).

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 \( C \).

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

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

\( S \) is true from the evidence. Suppose that \( C \) is true in the state.
We will be sampling for \( R \).

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 \( R \).

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

\( P(R | \neg C, S, W) \) is calculated similarly.