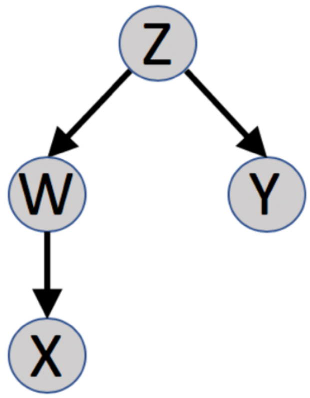
CSCI 378 HW4



Prove that, in any probability distribution that factors according to the above Bayesian network, X is conditionally independent of Y given W. Use only the following:

- the definition of a Bayesian network
- the definition of conditional probability
- the fact that probability distributions sum to 1
- the law of total probability
- general-purpose algebraic manipulations

I'll get you started. For all values of x, w, and y:

$$
\begin{aligned}
P(x \mid w, y) &= \frac{P(x, w, y)}{P(w, y)} && \text{[from the definition of conditional probability]} \\
&= \frac{\sum_z P(x, w, y, z)}{\sum_z \sum_{x'} P(x', w, y, z)} && \text{[from the law of total probability]} \\
&= \quad \ldots
\end{aligned}
$$