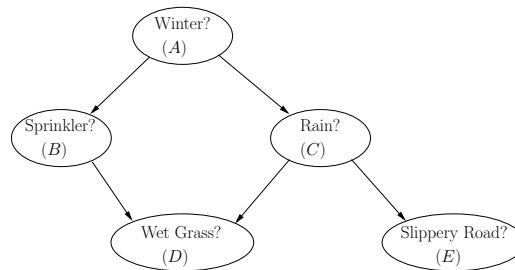


Probabilistic Models: Spring 2014

Parameter Estimation with Complete Data

Example

We are given the following Bayesian network G .



We are also given the following dataset D .

A	B	C	D	E	Count
T	F	T	T	T	20
T	F	F	F	F	15
F	T	F	T	T	10
F	F	T	T	T	15
F	F	F	F	F	5
T	T	F	T	F	2

1. Calculate the MLE parameters for the network
2. Calculate the Bayesian parameters for the network with ESS=0.1
3. Calculate the Bayesian parameters for the network with ESS=100

Useful Equations

$$\begin{aligned}\hat{\theta}_{ijk}^{ML} &= \frac{n_{ijk}}{\sum_k n_{ijk}} \\ \hat{\theta}_{ijk}^{MAP} &= \frac{\alpha_{ijk} + n_{ijk}}{\sum_k (\alpha_{ijk} + n_{ijk})} \\ \alpha_{ijk} &= \frac{\alpha}{r_i q_i}\end{aligned}$$

when parameters are Dirichlet distributed