

CSE 527 HW 3

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1. Conditional Independence in Bayesian Networks

(a) true

(b) false

2. Conditional Independence in Undirected Graphical Models

(a) true

(b) false

3. Graphical LASSO

Multiple Gaussian Distribution

PDF:

$$f(x) = \left((2\pi)^k |\Sigma| \right)^{-\frac{1}{2}} \cdot \exp \left(-\frac{1}{2} (x-\mu)^T \Sigma^{-1} (x-\mu) \right)$$

$$\ln(f(x)) = -\frac{1}{2} k \cdot \ln(2\pi) - \frac{1}{2} \ln(\det \Sigma) - \frac{1}{2} (x-\mu)^T \Sigma^{-1} (x-\mu)$$

$$(\Sigma = S, \Sigma^{-1} = \Theta)$$

$$= -\frac{1}{2} k \ln(2\pi) - \frac{1}{2} \left(\ln(\det S) + \ln(\det \Theta) - \ln(\det \Theta) \right)$$

$$- \frac{1}{2} \sum_{ij} \theta_{ij} \underbrace{(x-\mu)_i (x-\mu)_j}_{\text{sample covariance: } S_{ij}}$$

$$= \frac{1}{2} \ln(\det(\Theta)) - \frac{1}{2} \sum_{ij} \theta_{ij} \cdot S_{ij} - \frac{1}{2} k \ln(2\pi)$$

$\Theta \cdot S = I_0$

$$= \frac{1}{2} \ln(\det(\Theta)) - \frac{1}{2} \text{tr}(\Theta \cdot S) - \frac{1}{2} k \ln(2\pi)$$

> constant!

4. please see “CNN.html”