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Parameter Estimation Assignment

1) normal distri.

given mean $= \theta_1$

variance $= \theta_2$

$$PDF = f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \cdot e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

$$L = \prod_{i=1} \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x_i-\mu)^2}{2\sigma^2}}$$

Take ln

$$\ln L = n \cdot \ln\left(\frac{1}{\sqrt{2\pi\sigma^2}}\right) + \ln\left(e^{-\frac{1(x_i-\mu)^2}{2\sigma^2}}\right)$$

$$= n(\ln 1 - \ln(\sqrt{2\pi\sigma^2}) - \frac{1}{2\sigma^2} \Sigma (x_i-\mu)^2$$

$$= -n \ln(\sqrt{2\pi\sigma^2}) - \frac{1}{2\sigma^2} \Sigma (x_i-\mu)^2$$

For μ

$$\frac{\partial \ln L}{\partial u} = 0 \Rightarrow \frac{1}{2\sigma^2} \Sigma\, 2(x_i-\mu)(-1)$$

$$= \frac{1}{\sigma^2} \Sigma (x_i - \mu) = 0$$

$$\mu = \frac{\Sigma (x_i)}{n} = \bar{x} = \text{Sample mean}$$

for σ^2

$$\frac{\partial \ln(L)}{\partial \sigma^2} = 0$$

$$\frac{-n}{2} \times \frac{1}{2\pi\sigma^2} \times 2\pi + \frac{1}{2\sigma^4} \Sigma (x_i - \mu)^2 = 0$$

$$\sigma^2 = \sum_{i=1}^{n} \frac{(x_i - \mu)^2}{n}$$

2) Pdf $= {}^m C_{x_i} \theta^{x_i} (1-\theta)^{m-x_i}$

$$L = \prod_{i=1}^{n} {}^m C_{x_i} \theta^{x_i} (1-\theta)^{m-x_i}$$

$$\ln(L) = \sum_{i=1}^{n} (\ln ({}^m C_{x_i}) + x_i \ln\theta + (m-x_i) \ln (1-\theta))$$

$$\sum_{i=1}^{n} \left(\frac{x_i}{\theta} - \frac{(m-x_i)}{1-\theta} \right) = 0$$

$$\frac{\Sigma x_i}{\theta} = \frac{nm - \Sigma x_i}{1-\theta} \qquad \theta = \frac{\Sigma x_i}{n.m.}$$