

3)

对于可能出现的一组 $\{X_i = x_i\}$ 有

$$P(X_1 = x_1, \dots, X_n = x_n) = \frac{A_m^m A_{n-m}^{n-m}}{A_M^M A_{N-M}^{N-M}}$$

4)

$$\begin{aligned} & f(x_1, x_2, \dots, x_n) \\ &= (\sqrt{2\pi})^{-n} \sigma_1^{-n+2} \sigma_2^{-2} * \exp\left\{-\frac{1}{2\sigma_1^2}(\sum_{i=5}^n (x_i - a)^2 + (x_1 - a)^2 + (x_2 - a)^2) - \frac{1}{2\sigma_2^2}((x_3 - a)^2 + (x_4 - a)^2)\right\} \\ & \quad , \quad |x_1 - x_2| \leq |x_3 - x_4| \text{ 时} \\ &= (\sqrt{2\pi})^{-n} \sigma_1^{-2} \sigma_2^{-n+2} * \exp\left\{-\frac{1}{2\sigma_1^2}((x_1 - a)^2 + (x_2 - a)^2) - \frac{1}{2\sigma_2^2} \sum_{i=3}^n (x_i - a)^2\right\} \\ & \quad , \quad |x_1 - x_2| > |x_3 - x_4| \text{ 时} \end{aligned}$$