

- 已知联合概率分布求边缘概率分布及条件概率分布.

已知:

$P$  矩阵 (data 同上篇)

$$\downarrow$$

分两组:  $X = \begin{pmatrix} x_a \rightarrow m \\ x_b \rightarrow n \end{pmatrix} \quad m+n=P \quad \mu = \begin{pmatrix} \mu_a \\ \mu_b \end{pmatrix} \quad \Sigma = \begin{pmatrix} \Sigma_{aa} & \Sigma_{ab} \\ \Sigma_{ba} & \Sigma_{bb} \end{pmatrix}$

求:  $P(x_a), P(x_b | x_a)$

$P(x_a), P(x_a | x_b)$

方法: 配方法

引入定理: 已知  $x \sim N(\mu, \Sigma)$

$$y = Ax + B$$

结论:  $y \sim N(A\mu + B, A\Sigma A^T)$

$$E(y) = E(Ax + B) = AE(x) + E(B)$$

$$= A\mu + B$$

$$\text{Var}(y) = \text{Var}(Ax + B) = \text{Var}(Ax) + \underbrace{\text{Var}(B)}_0$$

$$= \underbrace{A \cdot \text{Var}(x) \cdot A^T}_{\text{对应}}$$

eg: 一维直观来看.

$$x \sim N(\mu, \sigma^2)$$

$$y = ax + b$$

$$\text{Var}(y) = a^2 \text{Var}(x)$$

// TODO