

Note of Probability Theory and Statistics

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1 Distribution

Multivariate normal distribution

$$f_{\mathbf{x}}(x_1, \dots, x_k) = \frac{e^{-\frac{(\mathbf{x} - \boldsymbol{\mu})^T \mathbf{C}^{-1} (\mathbf{x} - \boldsymbol{\mu})}{2}}}{\sqrt{(2\pi)^k |\mathbf{C}|}}$$

Where,

\mathbf{C} The symmetric covariance matrix.

\mathbf{x} A real k-dimensional column vector.

2 Distance

2.1 Distance of Random Variables (Same Distribution, Covariance Matrix= Σ)

Mahalanobis Distance

Distance of vector \mathbf{x} and set:

$$D_M(\mathbf{x}) = \sqrt{(\mathbf{x} - \boldsymbol{\mu})^T \mathbf{C}^{-1} (\mathbf{x} - \boldsymbol{\mu})}$$

Distance of two vectors \mathbf{x} and \mathbf{y} :

$$d(\mathbf{x}, \mathbf{y}) = \sqrt{(\mathbf{x} - \boldsymbol{\mu})^T \mathbf{C}^{-1} (\mathbf{x} - \boldsymbol{\mu})}$$

References