

Definition 10.17 The joint differential entropy $h(\mathbf{X})$ of a random vector \mathbf{X} with joint pdf $f(\mathbf{x})$ is defined as

$$h(\mathbf{X}) = - \int_{\mathcal{S}} f(\mathbf{x}) \log f(\mathbf{x}) d\mathbf{x} = -E \log f(\mathbf{X}).$$

Corollary If X_1, X_2, \dots, X_n are mutually independent, then

$$h(\mathbf{X}) = \sum_{i=1}^n h(X_i).$$

Theorem 10.18 (Translation) $h(\mathbf{X} + \mathbf{c}) = h(\mathbf{X})$.

Theorem 10.19 (Scaling) $h(A\mathbf{X}) = h(\mathbf{X}) + \log |\det(A)|$.