



## Gaussian distribution maximizes entropy for given covariance

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**Theorem 1** () *Let  $f : \mathbb{R}^n \rightarrow \mathbb{R}$  be a continuous probability density function. Let  $X_1, \dots, X_n$  be random variables with density  $f$  and with covariance matrix  $\mathbf{K}$ ,  $K_{ij} = \text{cov}(X_i, X_j)$ . Let  $\phi$  be the distribution of the <http://planetmath.org/JointNormalDistribution> Gaussian with mean  $\mathbf{0}$  and covariance matrix  $\mathbf{K}$ . Then the Gaussian distribution maximizes the differential entropy for a given covariance matrix  $\mathbf{K}$ . That is,  $h(\phi) \geq h(f)$ .*