Multivariate Gaussian distributions

The D-dimensional Gaussian pdf with mean vector μ and covariance matrix Σ is

$$\mathcal{N}(\mu, \Sigma) := \frac{1}{\sqrt{\tau^D \det(\Sigma)}} \exp\left(-\frac{1}{2}(x - \mu)^T \Sigma^{-1}(x - \mu)\right)$$

A Gaussian's parameters are fully specified by the coefficients of x in the exponent.

$$-2\ln \mathcal{N}(\mu, \Sigma) = (x - \mu)^T \Sigma^{-1}(x - \mu) + \text{constant}$$
$$= x^T \Sigma^{-1} x - x^T \Sigma^{-1} \mu - \mu^T \Sigma^{-1} x + \text{constant}$$