Multivariate Gaussian distribution

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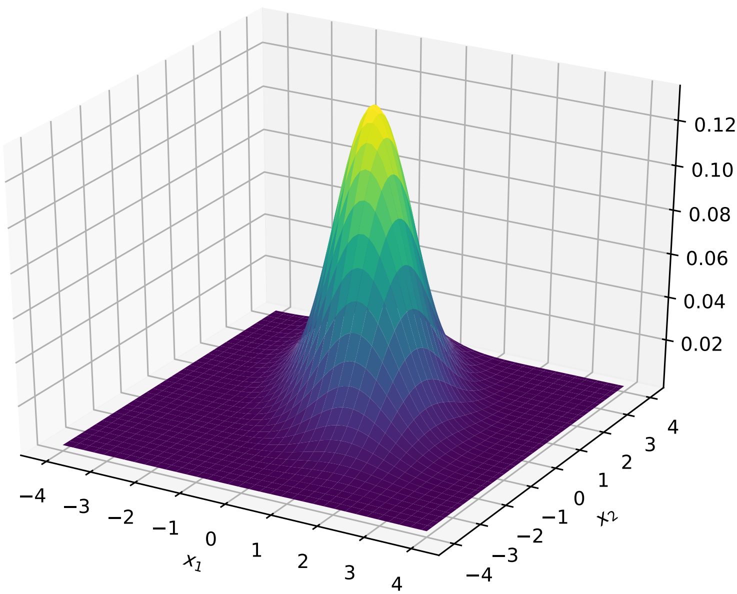
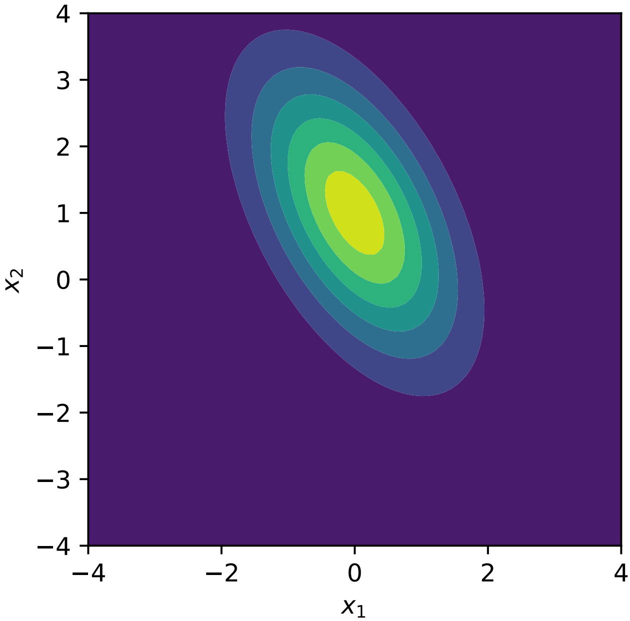
Multivariate Gaussian distribution

$$p(\mathbf{x}) = \mathcal{N}(\mathbf{x}; \boldsymbol{\mu}, \boldsymbol{\Sigma}) = \frac{1}{(2\pi)^{D/2}|\Sigma|^{1/2}} \exp\left\{-\frac{1}{2}(\mathbf{x}-\boldsymbol{\mu})^\top \boldsymbol{\Sigma}^{-1}(\mathbf{x}-\boldsymbol{\mu})\right\}$$

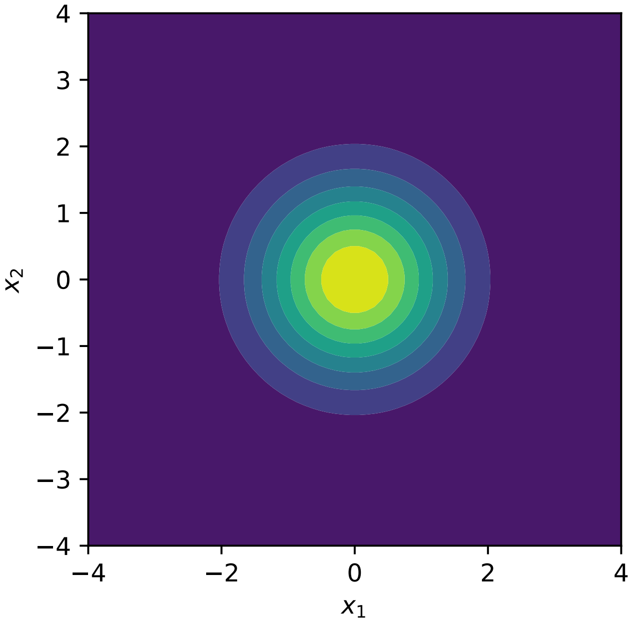


Arbitrary multivariate Gaussian



$$\boldsymbol{\mu} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \qquad \text{and} \qquad \boldsymbol{\Sigma} = \begin{bmatrix} 1 & -0.75 \\ -0.75 & 2 \end{bmatrix}$$

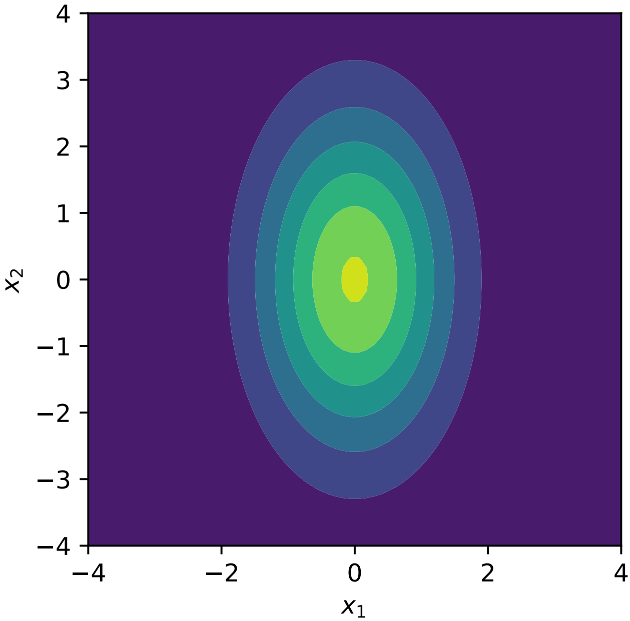
Standard multivariate Gaussian



$$\boldsymbol{\mu} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \qquad \text{and} \qquad \boldsymbol{\Sigma} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

This Gaussian has an identity covariance matrix.

Uncorrelated multivariate Gaussian



$$\boldsymbol{\mu} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \qquad \text{and} \qquad \boldsymbol{\Sigma} = \begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix}$$

This Gaussian has a diagonal covariance matrix.

Videos covered in this note

- Gaussians 2: Multivariate Gaussian distribution (5 min)