

Notation

Numbers and Arrays

Syntax	Description
a	A scalar (integer or real)
\mathbf{a}	A vector
\mathbf{A}	A matrix
\mathbf{A}	A tensor
\mathbf{I}_n	Identity matrix with n rows and n columns
\mathbf{I}	Identity matrix with dimensionality implied by context
$\mathbf{e}^{(i)}$	Standard basis vector $[0, \dots, 0, 1, 0, \dots, 0]$ with a 1 at position i
$\text{diag}(\mathbf{a})$	A square, diagonal matrix with diagonal entries given by \mathbf{a}
a	A scalar random variable
\mathbf{a}	A vector-valued random variable
\mathbf{A}	A matrix-valued random variable
θ	Parameters of a model
$f(\theta, \mathbf{x})$	A function (model) with parameters θ and data \mathbf{x}
$\mathbf{A} \odot \mathbf{B}$	Element-wise (Hadamard) product of \mathbf{A} and \mathbf{B}

Indexing

Syntax	Description
a_i	Element i of vector \mathbf{a} , with indexing starting at 1
$A_{i,j}$	Element i, j of matrix \mathbf{A}

Datasets and Distributions

Syntax	Description
\mathbf{X}	The design matrix with dimensionality $n \times p$ with n samples with p features.
$\mathbf{x}^{(i)}$	The i -th training example.
$\mathbf{y}^{(i)}$	The label-vector for the i -th training example.
$y^{(i)}$	The label for the i -th training example.

Probability Theory

Syntax	Description
$P(x)$	A probability distribution over a discrete variable.
$p(x)$	A probability distribution over a continuous variable or over a variable whose type has not been specified.
$\mathbb{E}_{x \sim P}[f(x)]$ or $\mathbb{E}f(x)$	Expectation of $f(x)$ with respect to $P(x)$
$\mathcal{N}(\mathbf{x}; \mu, \Sigma)$	Gaussian distribution over \mathbf{x} with mean μ and covariance Σ
$x \sim \mathcal{N}(\mu, \sigma)$	Gaussian distribution over x with mean μ and variance σ

Calculus

Syntax	Description
$\nabla_{\mathbf{w}} J$	Gradient of J with respect to \mathbf{w}
$\frac{\partial J}{\partial w}$	Partial derivative of J with respect to w

Functions

Syntax	Description
$\log x$	The natural logarithm of x .
$\ \mathbf{x}\ _p$	L^p norm of \mathbf{x}
$\ \mathbf{x}\ $	L^2 norm of \mathbf{x}

Deep Learning

Syntax	Description
NCHW	The input format of images in PyTorch. N: number of images (batch size), C: number of channels, H: height, W: width