Notation

Numbers and Arrays

Syntax	Description
\overline{a}	A scalar (integer or real)
a	A vector
\mathbf{A}	A matrix
Α	A tensor
\mathbf{I}_n	Identity matrix with n rows and n columns
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
$diag(\mathbf{a})$	A square, diagonal matrix with diagonal entries given by \mathbf{a}
a	A scalar random variable
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 paramters θ and data ${\bf x}$
$\mathbf{A}\odot\mathbf{B}$	Element-wise (Hadamard) product of A and B

Indexing

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

Datasets and Distributions

Syntax	Description
$\overline{\mathbf{X}}$	The design matrix with dimensionality nxp 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
$\overline{P(x)}$	A probability distribution over a discrete variable.
p(x)	A probability distribution over a continous 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 ${\bf x}$ 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
$\frac{\nabla_{\mathbf{w}} J}{\frac{\partial J}{\partial w}}$	Gradient of J with respect to \mathbf{w} Partial derivative of J with respect to w

Functions

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

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