

644

Table of Symbols

645

Symbol	Meaning
$a, b, c, \alpha, \beta, \gamma$	Scalars are lowercase
$\mathbf{x}, \mathbf{y}, \mathbf{z}$	Vectors are bold lowercase
$\mathbf{A}, \mathbf{B}, \mathbf{C}$	Matrices are bold uppercase
$\mathbf{x}^\top, \mathbf{A}^\top$	Transpose of a vector or matrix
\mathbf{A}^{-1}	Inverse of a matrix
$\langle \mathbf{x}, \mathbf{y} \rangle$	Inner product of \mathbf{x} and \mathbf{y}
$\mathbf{x}^\top \mathbf{y}$	Dot product of \mathbf{x} and \mathbf{y}
$B = (\mathbf{b}_1, \mathbf{b}_2, \mathbf{b}_3)$	(Ordered) tuple
$\mathbf{B} = [\mathbf{b}_1, \mathbf{b}_2, \mathbf{b}_3]$	Matrix of column vectors stacked horizontally
$\mathcal{B} = \{\mathbf{b}_1, \mathbf{b}_2, \mathbf{b}_3\}$	Set of vectors (unordered)
\mathbb{Z}, \mathbb{N}	integers and natural numbers, respectively
\mathbb{R}, \mathbb{C}	Real and complex numbers, respectively
\mathbb{R}^n	n -dimensional vector space of real numbers
$a := b$	a is defined as b
$a =: b$	b is defined as a
$a \propto b$	a is proportional to b , i.e., $a = \text{const.} \cdot b$
$g \circ f$	Function composition; “ g after f ”
\iff	if and only if
\implies	implies
\mathcal{A}, \mathcal{C}	Sets
$a \in \mathcal{A}$	a is an element of the set \mathcal{A}
\mathcal{B}	Basis set
\emptyset	Empty set
D	Number of dimensions; indexed by $d = 1, \dots, D$
N	Number of data points; indexed by $n = 1, \dots, N$
\mathbf{I}_m	identity matrix of size $m \times m$
$\mathbf{0}_{m,n}$	matrix of zeros of size $m \times n$
$\mathbf{1}_{m,n}$	matrix of ones of size $m \times n$
\mathbf{e}_i	Standard/canonical vector (where i is the component that is 1)
\dim	Dimensionality of vector space
$\text{rk}(\mathbf{A})$	Rank of matrix \mathbf{A}
$\text{Im}(\Phi)$	Image of linear mapping Φ
$\text{ker}(\Phi)$	Kernel (null space) of a linear mapping Φ
$\text{span}[\mathbf{b}_1]$	Span (generating set) of \mathbf{b}_1
$\det(\mathbf{A})$	determinant of \mathbf{A}
$\text{tr}(\mathbf{A})$	trace of \mathbf{A}
$ \cdot $	Absolute value
$\ \cdot\ $	Norm; Euclidean unless specified
λ	Eigenvalue
E_λ	Eigenspace of eigenvalue λ

646

647

Symbol	Meaning
$\boldsymbol{\theta}$	Parameter vector
$\frac{\partial f}{\partial x}$	Partial derivative of f with respect to x
$\frac{df}{dx}$	Total derivative of f with respect to x
∇	Gradient
\mathcal{L}	Lagrangian
\mathcal{L}	Negative log-likelihood
$\binom{n}{k}$	Binomial coefficient, n choose k
$\text{V}_X[\boldsymbol{x}]$	Variance of \boldsymbol{x} with respect to the random variable X
$\mathbb{E}_X[\boldsymbol{x}]$	Expectation of \boldsymbol{x} with respect to the random variable X
$\text{Cov}_{X,Y}[\boldsymbol{x}, \boldsymbol{y}]$	Covariance of \boldsymbol{x} and \boldsymbol{y} .
$X \perp\!\!\!\perp Y \mid Z$	X is conditionally independent of Y given Z
$X \sim p(\theta)$	Random variable X is distributed according to $p(\theta)$
$\mathcal{N}(\boldsymbol{\mu}, \boldsymbol{\Sigma})$	Gaussian distribution with mean $\boldsymbol{\mu}$ and covariance $\boldsymbol{\Sigma}$
$\text{Ber}(\mu)$	Bernoulli distribution with parameter μ
$\text{Bin}(N, \mu)$	Binomial distribution with parameters μ, N
$\text{Beta}(\alpha, \beta)$	Beta distribution with parameters α, β

649

Table of Acronyms

Acronym	Meaning
REF	Row Echelon Form
ONB	Orthonormal Basis
MLE	Maximum Likelihood Estimation
PCA	Principal Component Analysis
PPCA	Probabilistic Principal Component Analysis
SVM	Support Vector Machines

650