Glossary of Symbols

i.i.d.	independent and identically distributed
c.d.f.	cumulative distribution function
p.d.f.	probability density function
c.h.f.	cumulative hazard function
a.s.	almost surely
a.e.	almost everywhere
$\mathbb{1}$	indicator function
$\mathrm{card}(A)$, $\#A$	cardinality, number of elements of a set A
$\lfloor x \rfloor$	greatest integer less than or equal to x
$\lceil x \rceil$	smallest integer greater than or equal to x
$\langle x \rangle$	fractional part of x
f', $\dot{f}$	derivative of f
$f^{(k)}$	kth derivative of f
$f \circ g$	f composed with g
$\oplus$	direct sum of subspaces
$\times$	product of numbers, Cartesian product, product of measures
$\otimes$	Kronecker product of matrices, product of σ-fields
$\setminus$	difference of sets
$\propto$	proportional to
$a{:=}b$	a is equal to b by definition
$a_n \lesssim b_n$, $a_n \gtrsim b_n$	inequalities up to irrelevant multiplicative constant
$a_n \asymp b_n$	equality of order of magnitude
$a_n \sim b_n$	$a_n/b_n \to 1$
$a_n = O(b_n)$	a_n/b_n bounded
$a_n = o(b_n)$	$a_n/b_n \to 0$
$\gg$	bounded away from
$\to_p$	convergence in probability
$\rightsquigarrow$	convergence in law/distribution, weak convergence

$\leftarrow$	left side replaced by right side
$\leftrightarrow$	one-to-one correspondence
$o_p(a_n)$	sequence of random variables tending to zero in probability
$O_p(a_n)$	sequence of random variables bounded in probability
$=_d$	equality in distribution
$x^+ = \max(x, 0)$, $x^- = \max(-x, 0)$	
$a \vee b$, $a \wedge b$	maximum and minimum of a and b respectively
f^+, f^-	positive and negative parts of a function
$\log_+$, $\log_-$,	positive and negative parts of logarithm
$\log^k x = (\log x)^k$, $k > 0$	
$a^{[k]} = a(a+1)\cdots(a+k-1)$	ascending factorial
$\binom{n}{k}$	number of k-combinations out of n
$((a_{ij}))$	matrix with (i, j)th entry a_{ij}
$A^\top$	transpose of matrix A
$\det(A)$	determinant of A
$\mathrm{tr}(A)$	trace of A
$\mathrm{eig}_j(A)$	jth smallest eigenvalue of A

Sets

$\mathbb{N}$	set of natural numbers $\{1, 2, \ldots\}$
$\mathbb{N}_n = \{1, \ldots, n\}$, $n \in \mathbb{N}$	
$\mathbb{N}_0 = \{0, 1, 2, \ldots\}$	
$\mathbb{Z}$	set of all integers
$\mathbb{R}$	real line
$\mathbb{Q}$	set of rational numbers
$\mathbb{R}^+$	set of positive real numbers
$\mathbb{Q}^+$	set of positive rational numbers
$\mathbb{C}$	set of complex numbers
$\mathbb{R}^k$	k-dimensional Euclidean space
$\mathbb{R}^\infty$	set of all sequences of real numbers
$\mathbb{S}_k$	k-dimensional unit simplex $\{(x_1, \ldots, x_k) \in \mathbb{R}^k : x_i \geq 0, \forall i, \sum_{i=1}^k x_i = 1\}$
$\mathbb{S}_\infty$	infinite-dimensional unit simplex $\{(x_1, x_2, \ldots) \in \mathbb{R}^\infty : x_i \geq 0, \forall i, \sum_{i=1}^\infty x_i = 1\}$
$\mathscr{R}, \mathscr{R}^k, \mathscr{R}^\infty$	Borel σ-fields on $\mathbb{R}$, $\mathbb{R}^k$, $\mathbb{R}^\infty$ respectively
$\mathrm{Re}(z)$	real part of complex number z
$\mathrm{Im}(z)$	imaginary part of complex number z
$\mathrm{vol}(A)$	(hyper)volume of A (in any dimension)
$\bar{A}$	closure of set A
$\mathrm{int}(A)$	interior of A
∂A	topological boundary of A
$\mathrm{lin}(B)$	linear span of B
$\mathrm{conv}(B)$	convex hull of B

$\overline{\mathrm{lin}}(B)$	closed linear span of B
$\overline{\mathrm{conv}}(B)$	closed convex hull of B
$\sigma\langle\mathscr{F}\rangle$	σ-field generated by $\mathscr{F}$

Spaces, Norms and Distances

$\mathbb{L}_p(\mathfrak{X}, \mathscr{X}, \mu)$	space of p-integrable functions on measure space $(\mathfrak{X}, \mathscr{X}, \mu)$, $0 < p < \infty$
$\mathbb{L}_\infty(\mathfrak{X}, \mathscr{X}, \mu)$	space of essentially bounded functions on measure space $(\mathfrak{X}, \mathscr{X}, \mu)$
$\mathbb{L}_p(\mathbb{R}), \mathbb{L}_p(\mathbb{R}^k)$	Lebesgue $\mathbb{L}_p$-spaces
$\mathfrak{L}_\infty(T)$	space of bounded functions on T
ℓ_p	p-summable real sequences
ℓ_∞	bounded real sequences
$\mathfrak{W}^\alpha$	real sequences of Sobolev smoothness α: (w_j) with $(j^\alpha w_j) \in \ell_2$
$\mathfrak{M}(\mathfrak{X})$	space of probability measures on a sample space $\mathfrak{X}$
$\mathfrak{M}_\infty(\mathfrak{X})$	space of (positive) measures on a sample space $\mathfrak{X}$
$\mathfrak{C}(\mathfrak{X})$	space of continuous functions on $\mathfrak{X}$
$\mathfrak{C}_b(\mathfrak{X})$	space of bounded continuous functions on $\mathfrak{X}$
$\mathfrak{C}^\alpha(\mathfrak{X})$	Hölder space of functions of smoothness α on $\mathfrak{X}$
$\mathfrak{UC}(\mathfrak{X})$	space of uniformly continuous functions on $\mathfrak{X}$
$\mathfrak{W}^\alpha(\mathfrak{X})$	Sobolev space of functions of smoothness α on $\mathfrak{X}$
$\mathfrak{B}^\alpha_{p,q}(\mathfrak{X})$	Besov space of functions of smoothness α on $\mathfrak{X}$
$\mathfrak{D}(\mathfrak{X})$	Skorohod space of cadlag functions on $\mathfrak{X}$
$\|f\|_p$	ℓ_p-norm or $\mathbb{L}_p$-norm of f, $1 \le p \le \infty$
$\|f\|_{p,G}$	$\mathbb{L}_p$-norm of f with respect to measure G, $1 \le p \le \infty$
$\|f\|_{\mathrm{Lip}}$	Lipschitz norm of f, smallest number such that $\lvert f(x) - f(y)\rvert \le \|f\|_{\mathrm{Lip}}\|x - y\|$
$\|f\|_{\mathfrak{C}^\alpha}$	Hölder α-norm of f
$\|f\|_{p,q,\alpha}$	Besov norm of f
$\|f\|_{2,2,\alpha}$	Sobolev norm of order α of f
$\|f\|_\infty$	Uniform (or supremum) norm
d_{KS}	Kolmogorov–Smirnov distance
d_{TV}	total variation distance
d_H	Hellinger distance
d_L	Lévy distance
d_{BL}	bounded Lipschitz distance
$K(P; Q)$	Kullback–Leibler (KL) divergence
$V_k(P; Q), V_{k,0}(P; Q)$	KL variation of order k, centered
$K^+(P; Q), K^-(P; Q)$	signed KL divergences
$V^+(P; Q), V^-(P; Q)$	signed KL variations
$\rho_{1/2}$	affinity
ρ_α	Hellinger transform

D_α	α-divergence
R_α	Renyi divergence
$D(\epsilon, S, d)$	ϵ-packing number of B with respect to distance d
$N(\epsilon, S, d)$	ϵ-covering number of B with respect to distance d
$N_{[\,]}(\epsilon, S, d)$	ϵ-bracketing number of B with respect to distance d
$N_{]}(\epsilon, S, d)$	ϵ-upper bracketing number of B with respect to distance d
$\mathrm{supp}(P)$	topological support of a (probability) measure
$\mathrm{KL}(\Pi)$	Kullback–Leibler support of a prior Π

Random Variables and Distributions

$\mathrm{E}(X)$	expectation of X
$\mu f = \mu(f) = \int f\,d\mu$	
$\mathrm{var}(X)$	variance of X
$\mathrm{sd}(X)$	standard deviation of X
$\mathcal{L}(X)$	law (distribution) of X
$\mathrm{cov}(X, Y)$	covariance of X and Y
$\mathrm{Cov}(X)$	covariance matrix of random vector X
$X \perp\!\!\!\perp Y$	random variables X and Y are independent
$X =_d Y$	X and Y have the same distribution/law
$X \sim P$	X has distribution P
$X_i \overset{\text{iid}}{\sim} P$	$X_1, X_2, \ldots$ are i.i.d. and have distribution P
$X_i \overset{\text{ind}}{\sim} P_i$	$X_1, X_2, \ldots$ are independent and $X_i \sim P_i$
$\mathbb{P}_n$	empirical measure
$\mathbb{G}_n$	empirical process
$\mathrm{Nor}(\mu, \sigma^2)$	normal distribution with mean μ and variance σ^2
$\mathrm{Nor}_k(\mu, \Sigma)$	k-variate normal distribution with mean vector μ and dispersion matrix Σ
$\phi_{\mu,\Sigma}$	normal density with mean (vector) μ and dispersion (matrix) Σ
$\mathrm{Bin}(n, p)$	binomial distribution with parameters n and p
$\mathrm{Poi}(\lambda)$	Poisson distribution with mean λ
$\mathrm{Unif}(a, b)$	uniform distribution over (a, b)
$\mathrm{Exp}(\lambda)$	exponential distribution with mean $1/\lambda$
$\mathrm{Ga}(a, b)$	gamma distribution with shape a and scale b
$\mathrm{ga}(x; a, b)$	gamma density $x \mapsto (b^a/\Gamma(a))e^{-bx}x^{a-1}$
$\mathrm{Be}(a, b)$	beta distribution with parameter a and b
$\mathrm{be}(x; a, b)$	beta density $x \mapsto (\Gamma(a+b)/\Gamma(a)\Gamma(b))\; x^{a-1}(1-x)^{b-1}$
$\mathrm{Wei}(\alpha, \lambda)$	Weibull distribution with shape α and scale λ
Rad	Rademacher distribution, ± 1 with probability $1/2$
$\mathrm{MN}_k(n; p_1, \ldots, p_k)$	k-variate multinomial distribution with n trials
$\mathrm{Dir}(k; \alpha_1, \ldots, \alpha_k)$	k-dimensional Dirichlet distribution
$\mathrm{IGau}(\alpha, \gamma)$	inverse-Gaussian distribution
$\mathrm{NIGau}(k, \alpha)$	(multivariate) normalized inverse-Gaussian distribution on the unit simplex

$\mathrm{DP}(\alpha)$, DP_α	Dirichlet process and measure with base measure α
$\mathrm{IDP}(\alpha)$	invariant Dirichlet process with parameter α
$\mathrm{PT}(\mathcal{T}_m, \mathcal{A})$	Pólya tree process with partitions $\{\mathcal{T}_m\}$ and parameters $\mathcal{A}$
$\mathrm{PT}^*(\alpha, a_m)$	canonical Pólya tree process with mean α and parameters $\{a_m\}$