

Errata for Inference in Hidden Markov Models

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List of errors in the first two printings of the book, ordered by appearance in the text (the errors that have been corrected in the second printing are listed in the second of the two sections below). The most serious errors are those whose page number is typeset in bold face; the other generally do not alter the comprehension (but we are nonetheless very sorry that they are there). This list is also available in PDF format.

Errors in the second printing (December 2006)

Of course (and unfortunately) these errors were also present in the first printing.

Chapter 2

Page 37	Line 9 should read “the simplified notation $\mu Q f$ instead of $(\mu Q)(f)$ or $\mu(Qf)$.”	Maurice Charbit, 17 Jan 2008
Page 46	Second item should read $Q_W : (W \times C) \times \mathcal{W}$	David Haight, 5 Nov 2007

Chapter 3

Page 53	Line after (3.1) should read “ μ_n denotes the product distribution $\mu^{\otimes(n+1)}$ on $(Y^{n+1}, \mathcal{Y}^{\otimes(n+1)})$ ”	Thiery Balsaer, 2 Feb 2007
Page 56	Integrand on the right hand side of (3.9) should read $f(x_k) \phi_{\nu,0:n n}(y_{0:n}, dx_{0:n})$	Thiery Balsaer, 6 Feb 2007
Page 58	Last paragraph before Section 3.1.4: should read “This notation also constitutes”	Drew Creal, 7 Dec 2006
Page 61	Third sentence from bottom: should read “For HMMs” (not HHMs)	Drew Creal, 7 Dec 2006
Page 63	Equation (3.22) should read $\phi_{\nu,k}(f) = c_{\nu,k}^{-1} \int f(x') \int \phi_{\nu,k-1}(dx) Q(x, dx') g_k(x')$	Maurice Charbit, 17 Jan 2008
Page 138	Equation (5.47) should read $\hat{X}_{k+1 k-1} = A_k \hat{X}_{k k-1} + R_k \hat{U}_{k k-1} = A_k \hat{X}_{k k-1}$	Antoine Pichot, 9 Mar 2009
Page 149	Equation (5.104) should read $\mu_{X Y} = \Sigma_{X Y} (B^t \Sigma_V^{-1} y + \Sigma_X^{-1} \mu_X)$	Tommaso Proietti, 9 Jul 2009

Chapter 4

Page 78	Line 12 should read “particular expressions like $E[\sum_{k=0}^n s(X_k) Y_{0:n}]$ and $E[(\sum_{k=0}^n s(X_k))^2 Y_{0:n}]$,”	Maurice Charbit, 17 Jan 2008
Page 91	Line 19 should read “If ξ has a density f ”	Maurice Charbit, 17 Jan 2008

Chapter 5

Page 141	The ARE expression in Remark 5.2.12 should be $\Sigma = A\Sigma A^t - A\Sigma B^t(B\Sigma B^t + SS^t)^{-1}B\Sigma A^t + RR^t$.	Cornelius Probst, 13 Aug 2012
Page 123	Algorithm 5.1.2 should read “computed during the forward filtering pass (Algorithm 5.1.1)”	Maurice Charbit, 17 Jan 2008
Page 135	The last term in (5.33) should be $E(YX^t)$	Maurice Charbit, 17 Jan 2008
Page 139	(5.55) should read $\text{Cov}(\hat{X}_{k+1 k}) = A_k \text{Cov}(\hat{X}_{k k-1})A_k^t + H_k\Gamma_k H_k^t$	François Roueff, 16 May 2007
Page 154	The reference below (5.121) should be to (5.11) rather than (5.12)	Maurice Charbit, 17 Jan 2008
Page 155	Line 7 of Section 5.2.6 should read “is a Markov chain on a finite set C,”	Maurice Charbit, 17 Jan 2008

Chapter 6

Page 180	π_i should be π_k	Federica Citterio, 15 Apr 2017
Page 184	$\pi_k(x x_{k-1}, x_k)$ should be $\pi_k(x x_{k-1}, x_{k+1})$ (three times)	Maurice Charbit, 17 Jan 2008
Page 188	(6.18) should read $\exp - \left\{ \frac{(x - \phi x_{n-1})^2}{2\sigma^2} \right\}$	Hossein Gholami, 27 Mar 2007
Page 201	In algorithm 6.3.4, last equation on page 201 should read $\Sigma_{0 n}(c) = \Sigma_{0 0}(c) - \Sigma_{0 0}(c) [I + \Pi_{0 n}\Sigma_{0 0}(c)]^{-1} \Pi_{0 n}\Sigma_{0 0}(c)$	Drew Creal, 12 Dec 2006
Page 202	Algorithm 6.3.4 should read $\Sigma_{k n}(c) = \Sigma_{k k}(c) - \Sigma_{k k}(c) [I + \Pi_{k n}\Sigma_{k k}(c)]^{-1} \Pi_{k n}\Sigma_{k k}(c)$	Drew Creal, 7 Dec 2006
Page 204	First two equations of Example 6.3.7 have misplaced commas and the second one should read $Y_k = \mu_Y(C_{k,2}) + B(C_{k,2})W_k + S(C_{k,2})V_k$	Drew Creal, 7 Dec 2006
Pages 222–231	In Sections 7.2.2.2 (starting from Example 7.2.4), 7.2.2.3, and, 7.2.2.4, the use of T_k is not consistent with its definition in (7.15) and throughout these pages, T_k needs to be understood as T_{k-1} in the sense of (7.15)	Jimmy Olsson, 24 Jul 2007
Page 224	Last line of Section 7.2.2.2 should read “where the current local likelihood $g_k(x) = g_k(x, Y_k)$ is large,”	Jimmy Olsson, 24 Jul 2007

Chapter 7

Page 213	In last sentence of the page, the claim that “ $\hat{\mu}_{\nu, M, N}^{\text{SIR}}(f)$ is an unbiased estimate of $\mu(f)$ ” is incorrect (the valid statement is given by the equation below)	Jimmy Olsson, 12 Jun 2007
Page 216	In (7.10), $R_i(x_l, \cdot)$ should be $R_l(x_l, \cdot)$	Jimmy Olsson, 12 Jun 2007

Page 225	In the last equation, $R(c)$ should be $R(x)$	Maurice Charbit, 17 Jan 2008
Page 226	Line -6 should read “the Hessian of $\log t_k(x, \cdot)$ at the mode.”	Julien Cornebise, 1 Jun 2008
Page 230	In Example 7.2.6: First two equations of the EKF approximation should read $K_k(x) = 2\sigma_u^2 b a_{k-1}(x) [4\sigma_u^2 b^2 a_{k-1}^2(x) + \sigma_v^2]^{-1}$ and $m_k(x) = a_{k-1}(x) + K_k(x) [Y_k - b a_{k-1}^2(x)]$	Drew Creal, 7 Dec 2006
Page 231	Line 4 of second paragraph should read “[...] contained in g_1 is large compared to that provided [...]”.	Julien Cornebise, 27 Jan 2009
Page 232	Equation (7.32) should read $\hat{\mu}_{k,N}^{\text{IS}}(f) = \sum_{i=1}^N f(\xi_k^i) \frac{\prod_{l=0}^k \frac{d\mu}{d\nu}(\xi_l^i)}{\sum_{j=1}^N \prod_{l=0}^k \frac{d\mu}{d\nu}(\xi_l^j)}$	Maurice Charbit, 17 Jan 2008

Chapter 8

Page 253	Last paragraph of Section 8.1 should read “the updated empirical approximation $\hat{\phi}_{0:k+1 k+1}$ should approximate the distribution defined in [...]”	Cornelius Probst, 2 Aug 2010
Page 253	First two sentences after Algorithm 8.1.1, Algorithm 8.1.1 should be Algorithm 7.3.4 (twice)	Tobias Rydén, 12 Apr 2007

Chapter 9

Page 331	Rhs of (9.59) should read $\sum_{i=1}^{M_N} \beta_{k n}(\xi_k^{N,i}) \psi_{k n}(\xi_k^{N,i}) / \sum_{i=1}^{M_N} \beta_{k n}(\xi_k^{N,i})$	Ajay Jasra, 7 Feb 2010
Page 332	$\psi_{k n}(x)$ should be defined as $F_{k n} \cdots F_{n-1 n} f(x) - F_{k n} \cdots F_{n-1 n} f(x_0)$	Ajay Jasra, 7 Feb 2010
Page 332	In the rewriting of $\Delta_{k,n}^N(f)$, the upper index in the summation in the numerator should be M_N	Ajay Jasra, 7 Feb 2010
Page 340	Item (iii) of Corollary 9.5.11 should read $\mathbb{1}_{\{ V_{N,1} \geq \epsilon \sqrt{M_N}\}}$	Taylor Brown, 28 Feb 2019

Chapter 11

Page 408	Equation (11.9) should read $\tilde{\theta}_i \stackrel{\text{def}}{=} \sum_{j=i_0}^i \frac{m_j}{\sum_{k=i_0}^i m_k} \hat{\theta}^j$	Michael Egert, 12 Mar 2007
Page 413	The rightmost term in the second unnumbered equation should read $E[\nabla_{\theta} \log f(\xi^i; \hat{\theta}^{i-1}) \mathcal{F}^{i-1}]$	Michael Egert, 12 Mar 2007
Page 416	In (11.23), the sum should read $\sum_{j=i_0}^i \hat{\theta}^j$	Michael Egert, 12 Mar 2007
Page 432	The right hand side of the first unnumbered equation should read $\sum_{i=1}^{\infty} \gamma_{i+1}^2 \ \nabla_{\theta} \psi(\hat{\theta}^i)\ ^2 \int S(x) ^2 p(x; \hat{\theta}^i) \lambda(dx)$	Michael Egert, 12 Mar 2007
Page 433	In Theorem 11.3.6 and below, $H(\theta_*)$ should be $J(\theta_*)$ (three times)	Michael Egert, 12 Mar 2007
Page 434	Proof of Lemma 11.3.7 should read $\nabla_{\theta} \psi[\bar{\theta}(s)]_s - \nabla_{\theta} c[\bar{\theta}(s)] = 0$ (11.51), $\nabla_{\theta} \ell[\bar{\theta}(s)] = -\nabla_{\theta}^2 F[s; \bar{\theta}(s)] \nabla_s \bar{\theta}(s) h(s)$ (11.53) and $\nabla_s \ell[\bar{\theta}(s)] = -\{\nabla_s \bar{\theta}(s)\}^t \nabla_{\theta}^2 F[s; \bar{\theta}(s)] \nabla_s \bar{\theta}(s) h(s)$ (11.54) for consistent gradient notations	Michael Egert, 12 Mar 2007

Page 435	\mathcal{W} should be \mathcal{J}	Michael Egert, 12 Mar 2007
Page 436	\mathcal{W} should be \mathcal{J} (twice)	Michael Egert, 12 Mar 2007

Chapter 13

Page 487	Unnumbered formula on top of page should read $\frac{\pi(\theta')L(y_{0:n} \theta')}{\pi(\theta)L(y_{0:n} \theta)} \prod_j \left(\frac{\sigma'_j}{\sigma_j}\right)^2$	Oscar Rueda, 2 Apr 2008
Page 501	First sentence of second paragraph of Section 13.3 should read “parameters estimates in HMMs” (not HHMs)	Olivier Cappé, 11 Dec 2006

Errors in the first printing (August 2005)

Chapter 2

Page 35	Unnumbered display in Definition 2.1.1: g should be q	David Carter, 23 Mar 2006
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Chapter 3

Page 57	Seven lines after (3.12): should read “as defined in (3.11) and (3.12)”	Drew Creal, 18 Dec 2005
Page 58	One line before section 3.1.4: should read “depend on the distribution”	Drew Creal, 18 Dec 2005
Page 64	In (3.27): $\phi_{\nu,k}(f) = \phi_{\nu,k k-1}(fg_k)$ should be $\phi_{\nu,k}(f) = c_{\nu,k}^{-1} \phi_{\nu,k k-1}(fg_k)$	Tobias Rydén, 16 Feb 2006

Chapter 4

Page 81	First three sum should have $k = 0$ as lower index (rather $k = 1$)	Olivier Cappé, 25 Jul 2006
Page 93	Statement of Lemma 4.3.5 should read “For any ξ and ξ' in...”	Tobias Rydén, 24 Feb 2006
Page 101	There should be only one integral sign in the rhs of (4.32)	Tobias Rydén, 17 Mar 2006

Chapter 5

Page 135	Middle of the page: should read “also correspond to the first two moments”	Drew Creal, 18 Dec 2005
Page 138	In Remark 5.2.28: should read “In the general non-Gaussian model”	Drew Creal, 18 Dec 2005

Chapter 6

Page 184	Three lines from the bottom: should read “the fact that this function”	Drew Creal, 18 Dec 2005
Page 194	Spurious extra word at the beginning of Section 6.3.1.2	Drew Creal, 18 Dec 2005

Chapter 7

Page 226	Sentence above equation (7.21) should read “To choose the parameter”	Drew Creal, 18 Dec 2005
Page 227	Denominator of unnumbered equation after (7.23) should be $\sigma_k^{-1}(x) \left\{ \eta + \frac{[x' - m_k(x)]^2}{\sigma_k^2(x)} \right\}^{-(\eta+1)/2}$	Olivier Cappé, 07 Dec 2005
Page 228	Text below Figure 7.7 should read “as the MCMC method in Figure 6.9 approximates”	Drew Creal, 18 Dec 2005

Chapter 8

Page 256	In (8.8), f should be f_{k+1}	Olivier Cappé, 07 Jun 2006
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Chapter 9

Page 288	Below (9.1): should read “there is a range of results to assess the accuracy”	Drew Creal, 18 Dec 2005
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Chapter 10

Page 351	Last two lines of proof of Prop 10.1.4: maximal and maximum should be, respectively, minimal and minimum	Eva Mayer, 17 Apr 2006
Page 366	“Proposition (4.1.3) asserts...” should be “Proposition 4.1.3 asserts...”	Olivier Cappé, 22 Jun 2005
Page 392	Last line of proof of Theorem 10.5.4: “because” is misspelled	Eva Mayer, 17 Apr 2006

Chapter 11

Page 406	First paragraph: should read “produces highly variable parameter estimates”	Drew Creal, 18 Dec 2005
Page 426	“eigenvalues of $M(\theta_*)$ ” should be “eigenvalues of $\nabla_{\theta} M(\theta_*)$ ”	Jimmy Olsson, 29 Nov 2005
Page 427	(11.41) should be $S^{i+1} \stackrel{\text{def}}{=} \bar{S} \circ \bar{\theta}(S^i) = G(S^i), \quad \theta^{i+1} = \bar{\theta}(S^{i+1})$	Jimmy Olsson, 29 Nov 2005
Page 431	Inline expression before (11.45) should be $\hat{\theta}^i = \hat{\theta}^{i-1} + \gamma_i h(\hat{\theta}^{i-1}) + \gamma_i \zeta^i$	Jimmy Olsson, 29 Nov 2005

Page 432	First line of proof: $M^i = \sum_{j=1}^i \gamma_j \zeta^j$	Jimmy Olsson, 29 Nov 2005
Page 432	Last term in the rhs of the first unnumbered equation should be $\int S(x) ^2 p(x; \hat{\theta}^{i-1}) \lambda(dx)$	Jimmy Olsson, 29 Nov 2005
Page 432	Line after the first unnumbered equation contains a spurious right parentheses	Jimmy Olsson, 29 Nov 2005

Chapter 12

Page 445	Fifth line from the top: subscript should read $-\infty < k < \infty$	Eva Mayer, 17 Apr 2006
Page 454	Third line from the bottom: should read f_π instead of f_ϕ	Eva Mayer, 17 Apr 2006
Page 456	In the middle: should read $\mu_1 < \mu_2 \dots$ instead of $\mu_i < \mu_2 \dots$	Eva Mayer, 17 Apr 2006
Page 456	Fourth line of Example 12.4.7: should read $X_k = i$ instead of $X_k = x$	Eva Mayer, 17 Apr 2006
Page 461	Proof of Lemma 12.5.3: 1. should read $h_{k,\infty}$ instead of $h_{k,-\infty}$	Eva Mayer, 17 Apr 2006

Chapter 13

Page 475	Sentence on first line should read "difficult to come up with"	Drew Creal, 18 Dec 2005
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Chapter 14

Page 517	Repeated word "an" in statement of Theorem 14.1.9	Drew Creal, 18 Dec 2005
Page 534	Repeated word "called" in Definition 14.2.26	Eva Mayer, 17 Apr 2006

References

Page 626	Uncapitalized proper names in ref. Barron (1985)	Olivier Cappé, 03 Aug 2005
Page 631	Repeated word "estimation" in ref. Doucet and Robert (2002)	Drew Creal, 18 Dec 2005
Page 631	Uncapitalized word "models" in ref. Elliott <i>et al.</i> (1995)	Olivier Cappé, 08 Jul 2005
Page 632	Typo in the title of Fearnhead (1998)	Olivier Cappé, 17 Jun 2006
Page 635	Incorrect formatting of authors in refs. Jacquier <i>et al.</i> (1994, 2004)	Olivier Cappé, 03 Aug 2005
Page 639	Meng, X.-L. and Dyk, D. V. (1997) should be Meng, X.-L. and Van Dyk, D. (1997)	Olivier Cappé, 16 Feb 2006

Index

Pages 645-652

Page numbers in the index are *ahead* of the actual pages in the text : the discrepancy starts in part II (p. 347) with 2 pages and goes up to 6 pages for the material in parts III, IV (chapters 14 and 15 and appendices); corrected index available [here](#)

Olivier Cappé, 23
Nov 2005