Directional Statistics

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Errata to 1st printing

8^4	Insert 'of' after 'development'.
17^3	Replace '$\theta_1 - \alpha, \ldots, \theta_1 - \alpha$' by '$\theta_1 - \alpha, \ldots, \theta_n - \alpha$'.
$19_1 = (2.3.14)$	Replace 'θ' by 'θ_i'.
20_7	Replace '13, 13' by '13, 0'.
$22^4 = (2.4.10)$	The right hand side should be $$-c^3 \frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^3 + O(c^5)$$
$22^5 = (2.4.11)$	The right hand side should be $$1 - 2c^2 \frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^2 + \frac{2c^4}{3} \frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^4 + O(c^6).$$
22_5	Replace '$m_2 = 0.383 + 0.491i$' by '$m_2 = 0.383 - 0.030i$'.
22_3	Replace '$\hat{s} = 0.322$' by '$\hat{s} = -0.196$'.
$32_3 = (3.5.3)$	Replace $\frac{\partial \psi}{\partial \boldsymbol{\theta}}$ by $\frac{\partial \psi}{\partial \boldsymbol{\theta}^T}$.
$38^4 = (3.5.22)$	Replace '$\kappa^{-1/2}(\theta - \mu)$' by '$\kappa^{1/2}(\theta - \mu)$'.
$46^{14} = (3.5.48)$	Replace the term '$\phi(\theta; \mathbf{0}, \boldsymbol{\Sigma})$' in the denominator by '$\phi(\boldsymbol{\mu}; \mathbf{0}, \boldsymbol{\Sigma})$'.
$47_1 = (3.5.55)$	Replace $e^{2\pi i x}$ by e^{ix}.
51^{13}	Replace $e^{-a\|t\| - it\mu}$ by $e^{-a\|t\| + it\mu}$.
$51_6 = (3.5.70)$	Replace '$\phi_p = \rho^{\|p\|}, \quad \alpha_p = \rho^{\|p\|} \cos \mu, \quad \beta_p = \rho^{\|p\|} \sin \mu$' by '$\phi_p = \rho^{\|p\|} e^{ip\mu}, \quad \alpha_p = \rho^{\|p\|} \cos p\mu, \quad \beta_p = \rho^{\|p\|} \sin p\mu$'.
58^{5-6}	Replace 'square-summable' by 'square-integrable'.
58^{13}	Replace 'square-summable' by 'square-integrable'.

$67_3 = (4.4.12)$ Replace '$\simeq$' by '$=$'.

80_1 Replace '$n\text{var}\bar{R}$' by '$n\text{var}\left(\bar{R}\right)$'.

89_9 Insert '(up to addition of a constant)' after 'is'.

$89_8 = (5.4.3)$ The right hand side should be

$$\frac{n}{2}\log\left(1-\|\boldsymbol{\mu}\|^2\right)-\sum_{i=1}^{n}\log\left(1-\boldsymbol{\mu}^T\mathbf{x}_i\right).$$

90^{10} Replace

$$\hat{\rho}^2=\frac{1-\sqrt{1-\|\hat{\boldsymbol{\mu}}\|^2}}{1+\sqrt{1-\|\hat{\boldsymbol{\mu}}\|^2}} \quad \text{by} \quad \hat{\rho}=\frac{1-\sqrt{1-\|\hat{\boldsymbol{\mu}}\|^2}}{\|\hat{\boldsymbol{\mu}}\|}.$$

91_{6-4} The model with density (5.5.4) is not a special case of (5.5.2). It is symmetrical about 0 and, for large enough values of μ, it has modes at $\pm\mu$.

95^7 Replace '$O(n^{-1/2})$' by '$O(n^{-1})$'.

95^{13} Replace '$O(n^{-1})$' by '$O(n^{-2})$'.

Replace '1999' by '2001'.

$95_4 = (6.3.8)$ This should be

$$w=2n\left\{\hat{\kappa}\bar{R}-\log I_0(\hat{\kappa})\right\}=2n\left\{\hat{\kappa}A(\hat{\kappa})-\log I_0(\hat{\kappa})\right\}.$$

95_2 The right hand side should be

$$2n\left\{A(\hat{\kappa})+\hat{\kappa}A'(\hat{\kappa})-A(\hat{\kappa})\right\}.$$

108_{12} Delete 'the'.

113^5 Replace

$$\sum_{i=1}^{n}\sum_{j=1}^{n} \quad \text{by} \quad \sum_{i=1}^{n}\sum_{j\neq i}.$$

$117^2 = (6.4.3)$ The right hand side should be

$$\sum_{j=1}^{k}p_jS_j.$$

117^{4} = (6.4.4) The right hand side should be

$$\frac{1}{n}\sum_{j=1}^{k}\left(S_j-\bar{S}\right)^2 p_j$$

123_{10} = (7.2.23) The right hand side should be $2\kappa(n-R)+2\kappa(R-C)$.

139^{11-23} This subsubsection should be moved to the end of subsection 7.4.2 on page 141 (between lines 141_{11} and 141_{10}), replacing '**ANOVA Based on a**' (in line 139^{11}) by '**A**', replacing 'asymptotic large-sample' (in line 139_{8}) by 'high-concentration asymptotic', renumbering equations as follows:

(7.4.20) ↦ (7.4.17) (7.4.21) ↦ (7.4.18)
(7.4.22) ↦ (7.4.19) (7.4.23) ↦ (7.4.20)
(7.4.24) ↦ (7.4.21) (7.4.25) ↦ (7.4.22)
(7.4.17) ↦ (7.4.23) (7.4.18) ↦ (7.4.24)
(7.4.19) ↦ (7.4.25)

and replacing equation references as follows:

139_{8} (7.4.17) ↦ (7.4.23)
141_{19} (7.4.23) ↦ (7.4.20)
141_{17} (7.4.23) ↦ (7.4.20).

138_{4} This should be

$$\sum_{i=1}^{n}\|\mathbf{x}_i-\bar{\mathbf{x}}\|^2=n(1-\bar{R}^2).$$

139_{9} = (7.4.19) The first equation should be

$$\bar{d_i}=\frac{1}{n_i}\sum_{j=1}^{n_i}d_{ij}.$$

140_{12} = (7.4.24) The first term on the right hand side should be

$$\sum_{i=1}^{q}w_i g_2\left(\bar{R}_i\right)^2.$$

142^{14} Delete 'is' after 'Thus'.

$140_1 = (7.5.3)$ This equation should be

$$S = \frac{s_c^2}{nv_c(\hat{\kappa})} + \frac{s_s^2}{nv_s(\hat{\kappa})},$$

143^2 Replace '$-nA(\hat{\kappa})$' by '$-nI_2(\hat{\kappa})/I_0(\hat{\kappa})$'.

143^{4-6} These equations should be

$$\begin{aligned} v_c(\kappa) &= \frac{I_0(\kappa)^2 + I_0(\kappa)I_4(\kappa) - 2I_2(\kappa)^2}{2I_0(\kappa)^2} \\ &\qquad - \frac{(I_0(\kappa)I_3(\kappa) + I_0(\kappa)I_1(\kappa) - 2I_1(\kappa)I_2(\kappa))^2}{2I_0(\kappa)^2(I_0(\kappa)^2 + I_0(\kappa)I_2(\kappa) - 2I_1(\kappa)^2)} \\ v_s(\kappa) &= \frac{(I_0(\kappa) - I_4(\kappa))(I_0(\kappa) - I_2(\kappa)) - (I_1(\kappa) - I_3(\kappa))^2}{2I_0(\kappa)(I_0(\kappa) - I_2(\kappa))}, \end{aligned}$$

143^7 Replace 'approximations to their variances' by 'their conditional variances'.

151_{10} Insert 'Assume that there are no ties.' before 'Let s_i be'.

151_{7-4} Replace these lines by

$$\begin{aligned} &d_1 = \frac{1}{n_2}, \ldots, d_{s_1} = \frac{s_1}{n_2}, \qquad && d_{s_1+1} = \frac{s_1+1}{n_2} - \frac{1}{n_1}, \ldots, \\ &d_{s_2} = \frac{s_2}{n_2} - \frac{1}{n_1}, && d_{s_2+1} = \frac{s_2}{n_2} - \frac{2}{n_1}, \ldots, \qquad d_n = \frac{n_2}{n_2} - \frac{n_1}{n_1}. \end{aligned}$$

Hence, from (8.3.7) and some algebraic manipulation we obtain

$$U^2_{n_1,n_2} = \frac{1}{nn_2}\left\{\sum_{i=1}^{n_1}\left(r_i - \frac{n}{n_1}i\right)^2 - n_1\left(\bar{r} - \frac{n(n_1+1)}{2n_1}\right)^2\right\} + \frac{n+n_1}{12nn_1}. \qquad (8.3.8)$$

161_{15-11} Replace this paragraph by

'The projection (9.1.1) distorts the lower hemisphere more than the upper hemisphere. If the data are spread over both hemispheres then it is helpful to project the two hemispheres onto separate discs in the plane, using (9.1.1) on the upper hemisphere and the variant which replaces θ by $\pi - \theta$ on the right hand side of (9.1.1) on the lower hemisphere.'

162^{1-4} Replace 'tangent vectors $\ldots \mathbf{x}^T\boldsymbol{\mu} = 0$' by 'tangent vectors $\mathbf{z}$ to the sphere at $\boldsymbol{\mu}$ are wrapped onto the sphere by

$$\mathbf{z} \mapsto \cos(\|\mathbf{z}\|)\,\boldsymbol{\mu} + \frac{\sin(\|\mathbf{z}\|)}{\|\mathbf{z}\|}\mathbf{z} \qquad (9.1.3)$$

where $\mathbf{z}^T\boldsymbol{\mu} = 0$'.

164_{16-14} The equation array should be

$$\begin{aligned} S(\mathbf{a}) &= \frac{1}{n}\sum_{i=1}^{n}\|\mathbf{x}_i - \mathbf{a}\|^2 \\ &= 2(1 - \bar{\mathbf{x}}^T\mathbf{a}) \\ &= 2(1 - \bar{R}\bar{\mathbf{x}}_0^T\mathbf{a}). \qquad (9.2.3) \end{aligned}$$

164_{13} Replace 'middle expression' by 'last line'.

$166^{2,4}$ Replace '$\bar{\mathbf{x}}_0$' by '$\bar{\mathbf{x}}$' (3 times).

168^{19} Replace

$$\frac{\kappa}{2\sinh\kappa}\exp\left\{\kappa\boldsymbol{\mu}^T\mathbf{x}\right\} \quad \text{by} \quad \frac{\kappa}{\sinh\kappa}\exp\left\{\kappa\boldsymbol{\mu}^T\mathbf{x}\right\}$$

169^{5} Replace the integral in the numerator by $\int_{-1}^{1} te^{\kappa t}(1-t^2)^{(p-3)/2}dt$.

$170^{3} = (9.3.12)$ Replace $I_{(p-1)/2}(\kappa)$ by $I_{p/2-1}(\kappa)$.

172_{10} Replace '$(1 - \|\mathbf{y}\|^2)^{1/2}$' by 'proportional to $(1 - \|\mathbf{y}\|^2)^{-1/2}$'.

173_{12} Replace $M_p(\boldsymbol{\mu}_2, \kappa)$ by $M_q(\boldsymbol{\mu}_1, \kappa)$.

185^{4} Replace $\bar{\mathbf{x}}_0|R$ by $\bar{\mathbf{x}}_0|\bar{R}$.

185^{5} Replace $\boldsymbol{\mu}_0$ by $\boldsymbol{\mu}$.

185^{10} Replace '(9.5.8)' by '(9.5.6)'.

185^{11} This should be

$$\left\{(\mathbf{x}_1,\ldots,\mathbf{x}_n) : \|\bar{\mathbf{x}}\| = \bar{R}, \bar{\mathbf{x}}^T\boldsymbol{\mu} = \bar{C}\right\}$$

185^{14-15} These lines should be

Integration over $\left\{(\mathbf{x}_1,\ldots,\mathbf{x}_n) : \bar{\mathbf{x}}^T\boldsymbol{\mu} = \bar{C}\right\}$ gives the density of $\bar{C}$ as

$$\tilde{g}(\bar{C};\boldsymbol{\mu},\kappa) = c(\kappa)^n \exp\{n\kappa\bar{C}\}\tilde{g}(\bar{C};\boldsymbol{\mu},0),$$

and so the conditional density of $\bar{R}|\bar{C}$ is

$$\frac{g^*(\bar{R},\bar{C};\boldsymbol{\mu},0)}{\tilde{g}(\bar{C};\boldsymbol{\mu},0))}, \qquad (9.5.11)$$

$185_1 = (9.5.13)$ The right hand side should be

$$c(\kappa)^n c(n\kappa\bar{R})^{-1} f(\bar{R},\bar{R}_1,\ldots,\bar{R}_q;\boldsymbol{\mu},0).$$

$186^3 = (9.5.14)$ This should be

$$f(\bar{R}_1,\ldots,\bar{R}_q|\bar{R};\kappa) = \frac{f(\bar{R},\bar{R}_1,\ldots,\bar{R}_q;\boldsymbol{\mu},0)}{h_n(n\bar{R})}.$$

186_9 This should be

$$\mathrm{E}\left[\left(\sum_{i=1}^{p} X_i^2\right)\left(\sum_{j=1}^{p} X_j^2\right)\right] = 1$$

186_7 This should be

$$\mathrm{E}[X_i^4] = \mathrm{E}\left[\left(\frac{X_i + X_j}{\sqrt{2}}\right)^4\right] \quad j \neq i$$

190^{17} Delete 'and $n - t$'.

192^7 Replace 'tr $\mathbf{A}$' by 'κ_1'.

193_8 Replace '$\mathbf{a} \neq \mathbf{b}$' by '$\mathbf{a} \neq -\mathbf{b}$'.

$198^{14-15} = (10.3.5)$ This should be

$$I_\nu(\kappa) = (2\pi\kappa)^{-\frac{1}{2}} e^\kappa \left\{1 - \frac{4\nu^2 - 1}{8\kappa} + \frac{(4\nu^2-1)(4\nu^2-9)}{2(8\kappa)^2}\right\} + O(\kappa^{-3}).$$

203_6 This should be

$$l(\mathbf{A}; \pm\mathbf{x}_1, \ldots, \pm\mathbf{x}_n) = n\left\{\mathrm{tr}(\mathbf{A}\bar{\mathbf{T}}) - \log {}_1F_1\left(\frac{1}{2}, \frac{p}{2}, \mathbf{A}\right)\right\}.$$

207_{10} Replace '$O(n^{-1/2})$' by '$O(n^{-1})$'.

207_7 Replace '$O(n^{-1})$' by '$O(n^{-2})$'.

Replace '1999' by '2001'.

$214_8 = (10.4.26)$ The equation should be '$\Pr(\mathbf{x}^T\boldsymbol{\mu} \geq \cos\delta) = 1 - \alpha$'.

$215_2 = (10.4.31)$ The left hand side should be '$\sin\delta$'.

$220_{13,11}$ Replace '$1 - \boldsymbol{\mu}_1^T\boldsymbol{\mu}_2$' by '$1 - \bar{\mathbf{x}}_{01}^T\bar{\mathbf{x}}_{02}$'.

220_8 Replace '$\mathbf{x}_i^T\boldsymbol{\mu}_i$' by '$\bar{\mathbf{x}}_{0i}^T\boldsymbol{\mu}_i$'.

225_{10} The left hand side should be

$$\sum_{i=1}^{n} \|\mathbf{x}_i - \bar{\mathbf{x}}\|^2.$$

$225_1 = (10.6.19)$ This should be

$$\frac{(\sum_{i=1}^{q} n_i\bar{R}_i^2 - n\bar{R}^2)/(q-1)(p-1)}{(n - \sum_{i=1}^{q} n_i\bar{R}_i^2)/(q-1)(p-1)}.$$

$226_{10} = (10.6.21)$ Replace

$$\nu \log\left(\frac{n\sum_{i=1}^{q} R_i}{\nu}\right) \quad \text{by} \quad \nu \log\left(\frac{n - \sum_{i=1}^{q} R_i}{\nu}\right).$$

226_8 Replace '$\nu_i = 2(n_i - 1), \nu = 2(n - q)$' by
'$\nu_i = (p-1)(n_i - 1), \nu = (p-1)(n - q)$'.

232_3 Replace

$$\frac{p^2 + 6p + 20}{12(p+4)} \quad \text{by} \quad \frac{2p^2 + 3p + 4}{6(p+4)}.$$

232_2 Replace

$$\frac{-(p^2 + 3p + 8)}{3(p+4)(p^2 + p + 2)} \quad \text{by} \quad \frac{-(4p^2 + 3p - 4)}{3(p+4)(p^2 + p + 2)}.$$

232_1 Replace

$$\frac{p^2-4}{3(p+4)(p^2+p+2)(p^2+p+6)}$$

by

$$-\frac{4(p^2-4)}{3(p+4)(p^2+p+2)(p^2+p+6)}.$$

233^3 Replace '$O(n^{-3/2})$' by '$O(n^{-2})$'.

Replace '1999' by '2001'.

235^{11-12} (10.7.15) and (10.7.16) should be

$$w_b \simeq \frac{n(p^2-1)\left\{\mathrm{tr}(\bar{\mathbf{T}}^2)-\bar{t}_1^2-(1-\bar{t}_1)^2/(p-1)\right\}}{2(1-2\bar{t}_1+\hat{c}_{11})} \qquad (10.7.15)$$

$$w_g \simeq \frac{n(p^2-1)\left\{\mathrm{tr}(\bar{\mathbf{T}}^2)-\bar{t}_p^2-(1-\bar{t}_p)^2/(p-1)\right\}}{2(1-2\bar{t}_p+\hat{c}_{pp})}, \qquad (10.7.16)$$

235^{14} This line should be

$$\hat{c}_{11}=\frac{1}{n}\sum_{i=1}^{n}\left(\mathbf{x}_i^T\mathbf{t}_1\right)^4 \qquad \hat{c}_{pp}=\frac{1}{n}\sum_{i=1}^{n}\left(\mathbf{x}_i^T\mathbf{t}_p\right)^4.$$

235_{9-8} (10.7.17) and (10.7.18) should be

$$\frac{n(p^2-1)\left\{\mathrm{tr}(\bar{\mathbf{T}}^2)-\bar{t}_1^2-(1-\bar{t}_1)^2/(p-1)\right\}}{2(1-2\bar{t}_1+\hat{c}_{11})} \;\dot{\sim}\; \chi^2_{(p+1)(p-2)/2} \qquad (10.7.17)$$

$$\frac{n(p^2-1)\left\{\mathrm{tr}(\bar{\mathbf{T}}^2)-\bar{t}_p^2-(1-\bar{t}_p)^2/(p-1)\right\}}{2(1-2\bar{t}_p+\hat{c}_{pp})} \;\dot{\sim}\; \chi^2_{(p+1)(p-2)/2}, \qquad (10.7.18)$$

239_{13} The right hand side should be

$$\frac{1}{n}\sum_{i=1}^{q}\sum_{j=1}^{n_i}\left(\mathbf{x}_{ij}^T\mathbf{t}_p\right)^4.$$

$239_6 = (10.7.40)$ The right hand side should be

$$\frac{1}{n}\sum_{i=1}^{q}\sum_{j=1}^{n_i}\left(\mathbf{x}_{ij}^T\mathbf{t}_1\right)^4.$$

239_4 Replace '(10.7.40)' by '(10.7.39)'.

$247_1 = (11.2.4)$ Replace '$\sin^4(\pi n)$' in the lower line by '$\sin^4(\pi/n)$'.

248^3 Replace '$U_n = 0.398$' by '$U_n = 6.73$'.

248^4 Replace '10%' by '5%'.

Replace '4.59 and 4.6' by '5.7 and 5.8'.

248^5 Replace 'accepted' by 'rejected'.

249^7 Replace '$2(r_{cc}r_{ss} - r_{cs}r_{sc})r_1r_2$' by '$2(r_{cc}r_{ss} + r_{cs}r_{sc})r_1r_2$'.

249_8 Replace '$r_{cc}^2 = 0.974$, $r_{cs}^2 = 0.213$, $r_{sc}^2 = 0.152$, $r_{ss}^2 = 0.933$' by '$r_{cc} = 0.993$, $r_{cs} = 0.646$, $r_{sc} = 0.719$, $r_{ss} = 0.960$'.

249_7 Replace '0.714' by '0.713'.

Replace '$r^2 = 6.64$" by '$r^2 = 1.87$'.

249_5 Replace '$nr^2 = 66.4$' by '$nr^2 = 18.7$'.

254_{10} This should be

$$\mathbf{S}^* = \frac{1}{n}\sum_{i=1}^{n}\begin{pmatrix} \mathbf{x}_i\mathbf{x}_i^T & \mathbf{x}_i\mathbf{y}_i^T \\ \mathbf{y}_i\mathbf{x}_i^T & \mathbf{y}_i\mathbf{y}_i^T \end{pmatrix} = \begin{pmatrix} \mathbf{S}_{11}^* & \mathbf{S}_{21}^* \\ \mathbf{S}_{21}^* & \mathbf{S}_{22}^* \end{pmatrix},$$

262^8 Replace '$\mathbf{A}^T\mathbf{A} = \mathbf{I}_2$ and $\mathbf{Ab} = \mathbf{0}$' by '$\mathbf{A}^T\mathbf{A} = \left(1 - \|\mathbf{b}\|^2\right)\mathbf{I}_2$, $\mathbf{A^T b} = \mathbf{0}$ and $\|\mathbf{b}\| \leq 1$'.

264_{16} Replace 'is a' by 'is an'.

$269_4 = (12.3.3)$ This should be $F(x) = 1 - \exp(-\hat{\kappa}x)$.

269_2 This should be

$$\hat{\kappa} = \frac{n-1}{\sum_{i=1}^{n}\left(1 - \cos\theta_i'\right)} = \frac{n-1}{n\left(1 - \bar{R}\right)}$$

270^8 Replace '$\phi_i''\sqrt{\theta_i''}$' by '$\phi_i''\sqrt{\sin\theta_i''}$'.

271^2 Replace '0.530' by '0.389'.

271^6 Replace '0.953' by '0.885'.

271^9 Replace '0.250' by '0.490'.

279^5 The left hand side should be just $\hat{f}_T$.

287_8 Replace '$O(n^{-1/2})$' by '$O(n^{-1})$'.

287_4 Replace '$O(n^{-1})$' by '$O(n^{-2})$'.

Replace '1999' by '2001'.

289_5 Replace 'Fisher matrix' by 'matrix Fisher'.

293_{10} Replace 'in in' by 'in'.

294_{11} Replace '$O(n^{-1/2})$' by '$O(n^{-1})$'.

294_5 Replace

$$\frac{p^2(p^2+p-2)+2r(p-r)(p^2+4p-20)}{12r(p-r)(p-2)(p-1)(p+4)(p+2)}$$

by

$$\frac{2p^2(p-1)(p+2)-r(p-r)(5p^2+2p+8)}{6r(p-r)(p-2)(p+4)}.$$

294_4 Replace

$$-\left[\frac{p^2(p^2+p-2)-r(p-r)(p^2-2p+16)}{3r(p-r)(p^2+p+2)(p-2)(p+4)}\right]$$

by

$$-\left[\frac{4p^2(p-1)(p+2)-r(p-r)(13p^2+10p-8)}{3r(p-r)(p^2+p+2)(p-2)(p+4)}\right].$$

294_3 Replace

$$\frac{(p-2r)^2(p-1)(p+2)}{3r(p-r)(p-2)(p+4)(p^2+p+2)(p^2+p+6)}$$

by

$$\frac{4(p-2r)^2(p-1)(p+2)}{3r(p-r)(p-2)(p+4)(p^2+p+2)(p^2+p+6)}.$$

294_1 Replace '$O(n^{-1})$' by '$O(n^{-2})$'.

Replace '1999' by '2001'.

300_8 Delete 'If $\mathbf{H}$ is invertible'.

306_5 Delete 'a' before 'mouse'.

323_7 Replace '$O(n^{-1/2})$' by '$O(n^{-1})$'.

323_6 Replace '1999' by '2001'.

323_3 Replace '$O(n^{-1})$' by '$O(n^{-2})$'.

$325_{13} = (14.5.2)$ This line should be

$$f(\mathbf{x};\boldsymbol{\lambda},\kappa) = \{1+\kappa(\boldsymbol{\lambda}^T\mathbf{x}+1)\}\exp\{\kappa(\boldsymbol{\lambda}^T\mathbf{x}-1)\}, \mathbf{x} \in S^2, |\boldsymbol{\lambda}| = 1, \qquad (14.5.2)$$

325_{12} Replace "and $\boldsymbol{\lambda}$ is the 'mean shape'" by

"where $\boldsymbol{\lambda}$ is the shape of $(\boldsymbol{\mu}_1, \boldsymbol{\mu}_2, \boldsymbol{\mu}_3)$ and $\kappa = \sum_{i=1}^{3} (\boldsymbol{\mu}_i - \bar{\boldsymbol{\mu}})^2 / 4\sigma^2$".

$349_{6-5} = (A.4)$ Replace $\dfrac{(4p^2-1)(4p^2-9)}{2(8\kappa)^2}$ by $\dfrac{(4p^2-1)(4p^2-9)}{2!(8\kappa)^2}$.

Replace $\dfrac{(4p^2-1)(4p^2-9)(4p^2-25)}{2(8\kappa)^3}$

by $\dfrac{(4p^2-1)(4p^2-9)(4p^2-25)}{3!(8\kappa)^3}$.

$350^{10} = (A.10)$ Replace the integral in the numerator by $\int_{-1}^{1} te^{\kappa t}(1-t^2)^{(p-3)/2}dt$.

398^{19} Replace 'reconstruction' by 'reconstructions'.

398_{14} Insert 'matrix' before 'Langevin'.

398_{13} Replace 'Matsuita' by 'Matsusita'.

398_5 Replace 'likelhood' by 'likelihood'.

398_2 Replace '**53**' by '**54**'.

402^{11} Replace '1980' by '1981'.

404^{26} Replace '(1999)' by '(2001)'.

404^{27} Replace '*Submitted for publication.*' by '*J. Multivariate Anal.*, **77**, 1–20.'.

406^3 Insert 'matrix' before 'distribution'.

408_{16} Replace 'A-s 86' by 'AS 86'.

I am very grateful to all those who have pointed out errors in the text.

PEJ

21/2/14