Introduction to the Theory of
Regular Exponential Families

by

Søren Johansen

Misprints and changes

After the appearance of the lecture notes with the above title, some misprints and an error has been detected by Steffen Lauritzen and his students.

p.38 ℓ. 1-4	should read $\alpha \leqq P^v_\delta(K_v) = P^v_\delta(K_0)$, $P^v_\delta(K) \leqq P^v_\delta(K_v) = P^v_\delta(K_0)$ and $\alpha = P^v_{\delta_0}(K_v) = P^v_{\delta_0}(K_0)$ Integrating over v we find $\alpha \leqq P_{\delta,\beta}(K_0)$, $P_{\delta,\beta}(K) \leqq P_{\delta,\beta}(K_0)$ and $\alpha = P_{\delta_0,\beta}(K_0)$ Which shows that K_0 is unbiased and has larger power than K.	
p.39 ℓ. 9	homeomorphism	injective
p.40 ℓ. 5^-,3^-	int C	0 twice
p.40 ℓ. 6^-	We shall assume	We shall assume a strong condition that even implies (7.2).
p.40 ℓ. 5^-	There exists	There exists a relatively open set $0 \subset$ int C such that $\tau(\theta(\beta)) \in 0$, $\beta \in I$, and
p.41 ℓ. 6,8,2^-	int C	0 three times
p.41 ℓ. 9^-	differentiable	differentiable at $t=\tau(\theta(\alpha))$
p.41 ℓ. 8^-	at $t = \tau(\theta(\beta))$	erase
p.44 ℓ. 8	$\left(\frac{d\theta}{d\beta}\right)$	$\left(\frac{d\theta}{d\beta}\right)'$
	$\left(\frac{d\theta}{d\beta}\right)'$	$\left(\frac{d\theta}{d\beta}\right)$
p.46 ℓ. 3^-	v_0	v_0x
p.46 ℓ. 1^-	$\frac{d\theta}{d\alpha_0} i_0^{-1}\left(\frac{d\theta}{d\alpha_0}\right)' v_0$.	$\frac{d\theta}{d\alpha_0} j_0^{-1}\left(\frac{d\theta}{d\alpha_0}\right)' v_0$ where j_0 is the Fisher information about α at $\alpha = \alpha_0$.
p.49 ℓ. 11	$(0,j(\alpha_0))$	$(0,j^{-1}(\alpha_0))$
p.51 ℓ. 6	$(0,j(\alpha_0))$	$(\alpha_0,\frac{1}{m}j^{-1}(\alpha_0))$, where $j(\alpha_0)$ is the information about α at $\alpha = \alpha_0$

p.52 ℓ. 8^-	probem	problem
p.56 ℓ. 2	differens	difference
p.62 ℓ. 8^-	$(\hat{\tau} - \hat{\hat{\tau}})$	$n(\hat{\tau} - \hat{\hat{\tau}})$
p.71 ℓ. 7	$U_1, \ldots, U_k$	U_i, U_j
p.84 ℓ. 9^-	P^2	p^2
p.87 ℓ. 7^-	x^3	f(x) twice
6^-	dx	dx, and $f(x) = e^{x^3} - e^{-x^3}$.
ℓ. 3^-	x^3	f(x)
2^-	this	which
p.89 ℓ. 3	Rothamsted Experimental Station	NAG Oxford
8	D.A.	J.A.
	Rothamsted Exponential Station	NAG Oxford
p.91 ℓ. 9	49-96	71-80

Correction of the proof of Lemma 1.7

p.4 ℓ. 7	a.s μ	$x_0, x \notin N_{\theta_0} \cup N_\theta$, where N_θ and N_{θ_0} are null sets for μ.

p.4 ℓ. 8-14

This proof is incorrect. It should read as follows:

Since (β, u, ν) is a minimal representation we can choose $\theta_1, \ldots, \theta_m$ such $\beta(\theta_i) - \beta(\theta_0)$ $i = 1, \ldots, m$ are linearly independent. We define $B = (\beta(\theta_1) - \beta(\theta_0) \vdots \ldots \vdots \beta(\theta_m) - \beta(\theta_0))$ and $A = (\alpha(\theta_1) - \alpha(\theta_0) \vdots \ldots \vdots \alpha(\theta_m) - \alpha(\theta_0))$.

Then for $x \notin N_{\theta_0} \cup N_{\theta_1} \cup \ldots \cup N_{\theta_m}$ we find $B'(u(x) - u(x_0)) = A'(t(x) - t(x_0))$ which shows, for $c = B'^{-1}A'$, that $u(x) - u(x_0) = c(t(x) - t(x_0))$ a.s. μ .

Next we let V be the smallest vectorspace with the property that $t(x) - t(x_0) \in V$ a.s μ. Then $c : V \to R^m$ is a surjection. Let $u_1, \ldots, u_m$ be linearly independent vectors in R^m and let t_i have the property $c(t_i) = u_i$. Then $t_1, \ldots, t_m$ are linearly independent in V.

From the result just proved we find
$(\alpha(\theta)-\alpha(\theta_0))'(t(x)-t(x_0))=(\beta(\theta)-\beta(\theta_0))'c(t(x)-t(x_0))$ a.s. μ which shows that the functional $(\alpha(\theta) - \alpha(\theta_0))' - (\beta(\theta) - \beta(\theta_0))'c$ vanishes on V, and that in particular for the vectors t_i, we get $(\alpha(\theta) - \alpha(\theta_0))'t_i = (\beta(\theta) - \beta(\theta_0))'u_i$. Now let $U = (u_1 \vdots \ldots \vdots u_m)$, $T = (t_1 \vdots \ldots \vdots t_m)$ and $b = U'^{-1}T'$ then $b(\alpha(\theta) - \alpha(\theta_0)) = \beta(\theta) - \beta(\theta_0)$, which proves the first assertion. Finally we put $\theta = \theta_i$ and get $bA = B$ which shows $bc' = I$. Similarly $cT = U$ shows that $cb' = I$.