S B`rBb2 HBF2HB?QQ/

}i i2bib 7Q` 7 +iQ` KQ/

AJSa kykj ! lMBp2`bBiv Q7 J `vH

> xB[C KBH

lMBp2`bBiB "`mM2B . `mbb H K

?iiTb,ff? xB[DXKH

kd CmHv kykj

CQBMi rQ`F rBi? A`BMB JQmbi FB UGa1

A M i ` Q / m + i B Q M

* Q M i 2 t i

1 K T H Q v H i 2 M i p ` B # H 2 K Q / 2 H b U 7 +Y Q ` : K Q / 2 H
+ Q H H 2 + i 2 / 7 ` Q K b m ` p 2 v b p B b B K T H 2 ` M / Q K Q

S ? Q i Q + ` 2 / B 2 M M + ` b i 2 M B p T 2 H 2 Q b M ? K D M b T H b ? V X

R f R

A M i ` Q / m + i B Q M U + Q M i X V

G 2 Yi = (Y_1; : : : ; Y_p)$^{>}$ 2 f 0; 1g^{p} # 2 p 2 + i Q ` Q 7 " 2 ` M Q m H

h ? 2 T ` Q # # B H B i v Q 7 Q # b 2 ` p B yM = (y_{r1} 2 b: Ty$_p$)M b 2

7 Q ` rM = 1; : : : ; R := 2^{p} - B b ; B p 2 M # v i ? 2 D Q B M i / B b

$_r$ = P(Y = y_r) = P(Y_1 = y_{r1}; : : : ; Y_p = y_{rp}): U R

A Mi`Q/m+iBQM U+QMiXV

G2Yi = (Y1; : : : ; Yp)> 2 f0; 1gp #2 p2+iQ` Q7 "2`MQmH
h?2 T`Q# #BHBiv Q7 Q#b2`pBy M= (yr1; : : : ; yrp)M b2
7Q` rM= 1; : : : ; R := 2p - Bb ; Bp2M #vi?2 DQBMi /Bb

r = P(Y = yr) = P(Y1 = yr1; : : : ; Yp = yrp): UR

amTThQ=b12; : : : ; N Q#b2`piBY=Mb(h) Q`72`2+Q`/2/- M
mMhBBb bbB;M2/ UMQ`K HBbw2/rVBib?mwp=vNiX2B
G2pi = Nr=N #2i?2?2M i`vQR7@ip2+iQ` Q7 Tp QBiQ?

$$\hat{N}_r = \sum_h w_h[y^{(h)} = y_r]: \qquad \text{U k V}$$

A M i ` Q / m + i B Q M U + Q M i X V

G 2 Y i = (Y 1 ; : : : ; Y p) > 2 f 0 ; 1 g p # 2 p 2 + i Q ` Q 7 " 2 ` M Q m H

h ? 2 T ` Q # # B H B i v Q 7 Q # b 2 ` p B y M = (y r 1 ; : : : ; y r p) M b 2

7 Q ` r M = 1 ; : : : ; R := 2 p - B b ; B p 2 M # v i ? 2 D Q B M i / B b

r = P (Y = y r) = P (Y 1 = y r 1 ; : : : ; Y p = y r p) : U R

a m T T h Q = b 1 2 ; : : : ; N Q # b 2 ` p i B Y Q = y ( h ) b Q ` 7 2 ` 2 + Q ` / 2 / - P N

m M h B B b b b B ; M 2 / U M Q ` K H B b 2 / V B i ? m w p = w h

G 2 p i r = N r = N # 2 i ? 2 ? 2 M i ` v Q R 7 @ i ? 2 + i Q ` Q 7 T ? Q B i Q

X

N r = w h [y (h) = y r] : U k

h

. 2 M Q i 2 # i ? 2 R @ p 2 + i Q ` Q 7 D Q B M i T ` Q # # B H B i B

U ; ` 2 b k i y B R V 7 Q ` A A . b K T H 2 b i ? i

p

N (p) ! N R (0 ;) ; U j V

b N ! 1 - r ? 2 ` = 2 diag( ) > X h ? B b H b Q r Q ` F b r

+ Q K T H 2 t b U 6 m E k y B R V # m i K v i F 2 / B z 2 ` 2 M i T

S ` K2i`B+ KQ/2Hb

1X;X #BM `v 7 +iQ` KQ/2H
p `B #H2 TT`Q +? UbXiX +

$$Y_i = \begin{cases} 1 & Y_i > \quad i \\ 0 & Y_i \quad i \end{cases}$$

U9

$$Y = \quad +$$

$$N_q(0; \ ) \ ; \qquad N_p(0; \quad)$$

h?2 HQ;@HBF2H(B?;Q Q/B7bQ`

$$\log L(\ j \ Y) = \sum_{r=1}^{R} \hat{N}_r \log \ _r(\ ) \qquad U8$$

$$r?2`2(\ ) = \int^{R} \ _p(y \ j \ 0; \quad > + \ )dy \ X$$

6AJG K v #2/B{+mHi U?B;?
BMi2;` Hc T2`72+i b2T ` iB

6Q` T B` Q7 μ_i `BMY#-H2b Y_j; $j = 1; \ldots; p$ Mi/ $i < j$ - /2}M2

$$\pi^{(ij)}_{y_i y_j}(\ ) = P\ (Y_i = y_i; Y_j = y_j); \qquad y_i; y_j \in \{0; 1\}. \qquad \text{U e}$$

h?2`2 R`2 $\binom{p}{2}$ bm+? T`Q# #BHBiB2b $\sum_{y_i; y_j} \pi^{(ij)}_{y_i y_j}(\ ) = 1$ i X

S B`rBb2 HBF2HB?QQ/ 2biBK iBQM

6Q` T B` Q7 `MX (Y_i, Y_j), $i, j = 1, \ldots, p$ Mi < j - /2}M2

$$\pi^{(ij)}_{y_i y_j}(\theta) = P_\theta(Y_i = y_i, Y_j = y_j); \quad y_i, y_j \in \{0, 1\}. \quad \text{Ue}$$

h?2 2`2 R`=24 $\binom{p}{2}$ bm+? T`Q# #BHBiB2b $\left(\sum_{y_i, y_j} \pi^{(ij)}_{y_i y_j}(\theta) = 1\right)$ X

h?2 T B`rBb2 HQ;@HBF2HB?QQ/ Ui?2 Q#D2+iBp2 7mM+iBQMV

$$\log L_S(\theta \mid Y) = \sum_{i<j} \sum_{y_i} \sum_{y_j} \hat{N}^{(ij)}_{y_i y_j} \log \pi^{(ij)}_{y_i y_j}(\theta); \quad \text{Ud}$$

r?2`2 $\hat{N}^{(ij)}_{y_i y_j} = \sum_h w_h [y_i^{(h)} = y_i, y_j^{(h)} = y_j]$ X

S B`r B b2 H B F2 H B ? Q Q / 2 b i B K i B Q M

6 Q` T B` Q 7 Y` B M Y#-Hj2=b1 ; : : : ; p M i / < j - / 2 } M 2

$$\hat{\pi}^{(ij)}_{y_i y_j}(\theta) = P_\theta(Y_i = y_i, Y_j = y_j), \quad y_i, y_j \in \{0, 1\}.$$

h ? 2 ` 2 R` = 24 $\frac{p}{2}$ b m + ? T ` Q # # B H B i B 2 $\sum_{y_i, y_j} \hat{\pi}^{(ij)}_{y_i y_j}(\theta) = 1$ X

h ? 2 T B ` r B b 2 H Q ; @ H B F 2 H B E Q i Q B F F 2 Q k y ? R V k 7

$$\log L_S(\theta \mid Y) = \sum_{i<j} \sum_{y_i} \sum_{y_j} N^{(ij)}_{y_i y_j} \log \hat{\pi}^{(ij)}_{y_i y_j}(\theta),$$

r ? 2 ` N $\hat{\pi}^{(ij)}_{y_i y_j} = \sum_h w_h [y_i^{(h)} = y_i, y_j^{(h)} = y_j]$ X

G 2 $\hat{\theta}_{SG} = \arg\max_\theta L_S(\theta \mid Y)$ X l M / 2 ` + 2 ` i B M ` 2 ; m H ` B i

$$\sqrt{N}(\hat{\theta}_{SG} - \theta) \xrightarrow{D} N_m(0, H(\theta) J(\theta)^{-1} H(\theta)^{-1}),$$

r ? 2 ` U 2 o ` B M 2 k i y R M R X -

$$H(\theta) = E\left[\frac{\partial^2 \log L_S(\theta \mid Y)}{\partial \theta \partial \theta'}\right]$$

$$J(\theta) = \mathrm{Var}\left[\frac{\partial \log L_S(\theta \mid Y)}{\partial \theta}\right]$$

A M i ` Q / m + i B Q M

G B K B i 2 / B M 7 Q ` K i B Q M : P 6 i 2 b i b

a B K m H i B Q M b

* Q M + H m b B Q M b