Brief Article

The Author

April 18, 2016

$$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{p1} & x_{p2} & \dots & x_{pn} \end{bmatrix}; \quad Y = \begin{bmatrix} y_{11} & y_{12} & \dots & y_{1n} \\ y_{21} & y_{22} & \dots & y_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ y_{q1} & y_{q2} & \dots & y_{qn} \end{bmatrix} \tag{1}$$

$$\begin{aligned} a &= u^T X && (2) \\ b &= v^T Y && (3) \end{aligned}$$

$$\begin{aligned} c &= cov[a, b] && (4) \\ &= cov[u^T X, v^T Y] && (5) \\ &= u^T cov(X, Y) v && (6) \end{aligned}$$

$$\begin{aligned} X' &= X - rowmean(X); \quad p \times n && (7) \\ Y' &= Y - rowmean(Y); \quad q \times n && (8) \\ C_{XY} &= X' Y'^T/(n-1); \quad p \times q && (9) \\ &= U \Sigma V^T; \quad U : p \times s; V : q \times s && (10) \\ A &= X'^T U; \quad n \times s && (11) \\ B &= Y'^T V; \quad n \times s && (12) \end{aligned}$$

$$\begin{aligned} Z_X &= XA; \quad p \times s && (13) \\ Z_Y &= YA; \quad q \times s && (14) \end{aligned}$$

$$Z_X = \begin{bmatrix} z_{x11} & z_{x12} & \cdots & z_{x1s} \\ z_{x21} & z_{x22} & \cdots & z_{x2s} \\ \vdots & \vdots & \vdots & \vdots \\ z_{xp1} & z_{xp2} & \cdots & z_{xps} \end{bmatrix}; \quad Z_Y = \begin{bmatrix} z_{y11} & z_{y12} & \cdots & z_{y1s} \\ z_{y21} & z_{y22} & \cdots & z_{y2s} \\ \vdots & \vdots & \vdots & \vdots \\ z_{yq1} & z_{yq2} & \cdots & z_{yqs} \end{bmatrix} \tag{15}$$

$$score_{ijk} = |z_{xik} - z_{yjk}| \tag{16}$$

$$y_i = \beta_0 + \beta_1 Age_i + beta_2 App_i + \beta_{12} Age_i \cdot App_i + \beta_3 batch_i + \epsilon_i$$

Table 1:

	sample	cell type
1	WT4m	Int1
2	WT5m	Oligo3,Mgl2
3	WT6m	Oligo3,Mgl2
4	APP2m	CA2Pyr2
5	APP5m	Int1
6	APP6m	Choroid,Epend

Table 2:

	WT4m	WT5m	WT6m	APP2m	APP5m	APP6m
WT4m	1	0	0	0	1	0
WT5m	0	2	2	0	0	0
WT6m	0	2	2	0	0	0
APP2m	0	0	0	1	0	0
APP5m	1	0	0	0	1	0
APP6m	0	0	0	0	0	2

Table 3:

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	10.498	0.019	564.206	0
age4m	-0.011	0.024	-0.451	0.654
age5m	-0.037	0.022	-1.695	0.096
age6m	-0.062	0.024	-2.563	0.013
groupAPP	0.969	0.027	35.235	0
batchmouse	-0.040	0.020	-2.018	0.049
age4m:groupAPP	0.040	0.035	1.141	0.259
age5m:groupAPP	0.051	0.033	1.558	0.126
age6m:groupAPP	0.024	0.037	0.659	0.513