Exercise 18.12 $\quad X = UDV^T$

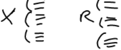
$\overset{!}{=} RV^T$

$i \in \text{fold } k$

$$(18.16) \quad \hat\beta_0, \hat\beta = \underset{\beta_0,\beta}{\operatorname{argmin}} \sum_{i=1}^{u} L(y_i, \beta_0 + x_i^T\beta) + \lambda\beta^T\beta$$

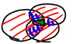
$$(18.17) \quad \hat\theta_0, \hat\theta = \underset{\theta_0,\theta}{\operatorname{argmin}} \sum_{i=1}^{u} L(y_i, \theta_0 + r_i^T\theta) + \lambda\theta^T\theta$$

$$\underbrace{X_B} = \underbrace{R_B} V^T \qquad x_i^T \leftrightarrow r_i^T$$



Exercise 18.16 $\qquad \alpha \leftrightarrow \dfrac{\alpha}{M}$ $\qquad$ M number of tests

a) $P(A) \le \alpha$



$$P(A) = P\left(\bigcup_{j=1}^{M} A_j\right)$$

$S_1 \ge S_2 \ge \dots \ge S_m$

$$\overset{!}{=} \underbrace{\sum_{j=1}^{M} P(A_j)}_{S_1} - \underbrace{\sum_{j<j'} P(A_j \cap A_{j'})}_{S_2} + \dots \underbrace{+(-1)^{n} \sum P\left(\bigcap_{j=1}^{M} A_j\right)}_{S_m}$$

$$\le \sum_{j=1}^{M} P(A_j) = \cancel{M}\frac{\alpha}{\cancel{M}} = \alpha$$

$$P(A) \le \alpha$$

b) $P(A) = 1 - P(A^c) = 1 - \prod_{j=1}^{M} P(A_j^c) = 1 - \left(1 - \dfrac{\alpha}{M}\right)^n$

Binomial approximation: $(1+x)^r \approx 1 - rx$

$x = -\dfrac{\alpha}{M}, \quad r = M \quad \Rightarrow 1 - \left(1 - \dfrac{\alpha}{M}\right)^M \approx 1 - \left(1 + \cancel{M}\left(+\dfrac{\alpha}{\cancel{M}}\right)\right)$

$= \cancel{1} - \cancel{1} + \alpha$