Animals: LME, but u contains breeding values for all animals

▲ Model: $y = Xb + Zu + e$ ← vector with q breeding values

$$E\begin{bmatrix} y \\ u \\ e \end{bmatrix} = \begin{bmatrix} Xb \\ 0 \\ 0 \end{bmatrix}$$

$$\text{var}\begin{bmatrix} y \\ u \\ e \end{bmatrix} = \begin{bmatrix} V & ZU & R \\ UZ^T & U & 0 \\ R & 0 & R \end{bmatrix}$$

$R = I \times \sigma_e^2$

$U = A \cdot \sigma_u^2$ with A being the numerator relationship matrix and σ_u^2 the additive genetic variance

$V = ZUZ^T + R$

▲ Predictions $\hat{u}$ and residuals $\hat{e}$ obtained from MME