Covariance:

$$\begin{aligned} cov(u, y^T) &= cov(u, [Xb + Zu + e]^T) \\ &= \underbrace{cov(u, b^T X^T)}_{\emptyset} + cov(u, u^T Z^T) \\ &\quad + cov(u, e^T) \\ &= \underline{\emptyset} + cov(u, u^T) \cdot Z^T + cov(u, e^T) \\ &= \underline{\emptyset} + var(u) \cdot Z^T + \underline{\emptyset} \\ &= U \cdot Z^T \end{aligned}$$

Model $y = Xb + Zu + e$

y: known; Xb, Zu, e: unknown

Goal: Use known components of a dataset to get estimates ($\hat{b}$) of fixed effects b and predicted breeding values ($\hat{u}$)

Estimate $\hat{b} = (X^T V^{-1} X)^{-} X^T V^{-1} y$ (see FLEM)

↳ Least Squares