2 What is G and G^{-1}

→ Specification of LME:

$\text{var}(u) = G$; example $u = \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_6 \end{bmatrix}$, if we use animal model

$$\Rightarrow \text{var}(u) = \text{var}\begin{pmatrix} u_1 \\ u_2 \\ \vdots \\ u_6 \end{pmatrix} = \begin{bmatrix} \text{var}(u_1) & \text{cov}(u_1,u_2) & \text{cov}(u_1,u_3) \\ \text{cov}(u_2,u_1) & \text{var}(u_2) & \cdots \end{bmatrix}$$

$$\text{var}(u_1) = \int (u_1 - E(u_1))^2 \cdot f(u_1)\, du_1$$

$$\text{cov}(u_1,u_2) = \iint (u_1 - E(u_1))(u_2 - E(u_2))\, f(u_1,u_2)\, du_1\, du_2$$

$$\text{cov}(u_2,u_1) = \int\int (u_1 - E(u_1))(u_1 - E(u_1))\, f(u_1)\, du_1\, du_1$$

$$= \int (u_1 - E(u_1))^2 f(u_1)\, du_1 = \text{var}(u_1)$$