$$X^T X = \frac{1}{n} \sum X_i X_i^T$$

$$\frac{1}{n} \sum \nabla R_i \nabla^T R_i$$

$$X = \begin{bmatrix} X_1^T \\ \vdots \\ X_n^T \end{bmatrix}$$

$$= \nabla R^T \nabla R$$

$$\nabla R = \begin{bmatrix} \nabla^T R_1 \\ \vdots \\ \nabla^T R_n \end{bmatrix}$$

$$\nabla Z = \begin{pmatrix} \nabla Z_1 \\ \vdots \\ \nabla Z_n \end{pmatrix}$$

and $\nabla Z_1 \sim N(0, \frac{n-1}{n} \Lambda)$