

$$\begin{aligned}
E(\mathbf{X} - E\mathbf{X})(\mathbf{X} - E\mathbf{X})^\top &= E \left[(X_i - EX_i)(X_j - EX_j) \right]_{i,j=1}^n \\
&= \left[E(X_i - EX_i)(X_j - EX_j) \right] \\
&= \left[\text{cov}(X_i, X_j) \right]
\end{aligned}$$