



**Matrix notation**

Let  $u_1, \dots, u_k \in \mathbf{R}^n$ . Define  $U \in \mathbf{R}^{n \times k}$  so that

$$U = \begin{bmatrix} u_1 & u_2 & \cdots & u_k \end{bmatrix}.$$

Then  $\{u_1, \dots, u_k\}$  is an orthonormal set mean

$$U^\top U = I_k$$

Notice that if  $k < n$ ,  $UU^\top \neq I$ , since its rank is at most  $k$ .



