LSI:

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} \cong \begin{bmatrix} U^{(1)} \\ U^{(2)} \\ U^{(3)} \end{bmatrix} \begin{bmatrix} S \end{bmatrix} \begin{bmatrix} V^T \end{bmatrix}$$
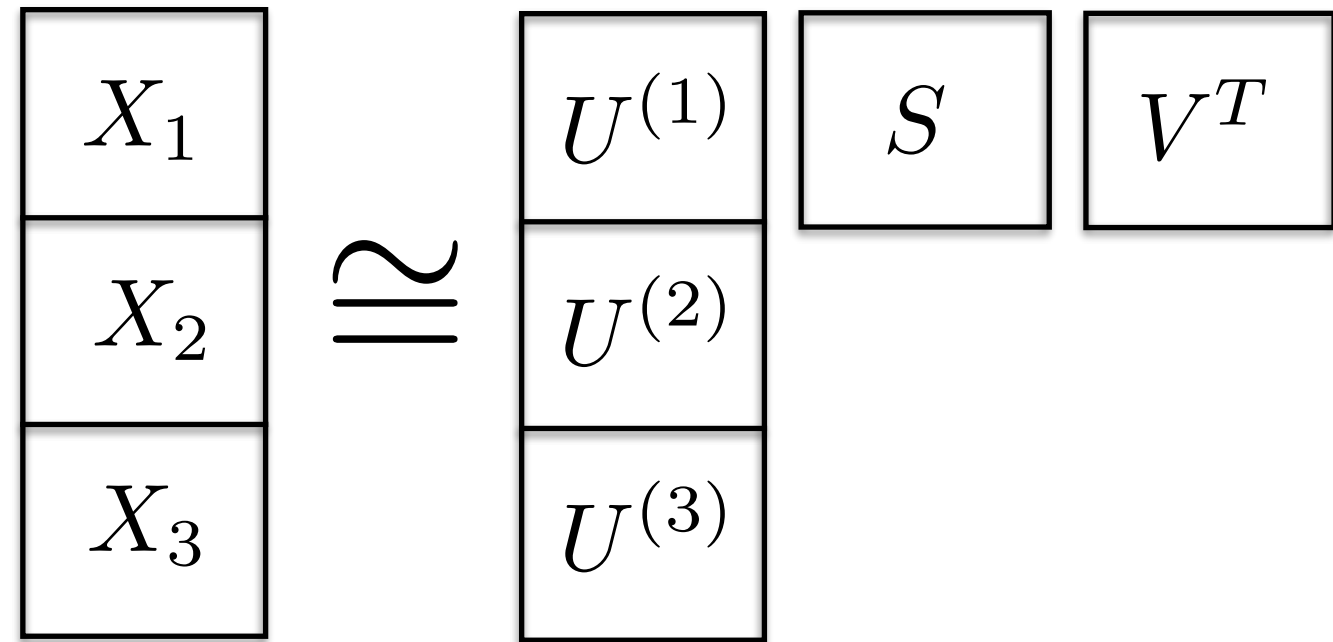
$$X = USV^T$$

$$U^T U = I \quad U \in \mathbb{R}^{N \times k}$$

$$V^T V = I \quad V \in \mathbb{R}^{s \times k}$$