

Reducing dimensionality by selecting first k singular vectors:

$$\begin{array}{c} |V| \\ \left[\begin{array}{c} \hat{X} \end{array} \right] \end{array} = \begin{array}{c} k \\ \left[\begin{array}{c} | \\ u_1 \\ | \end{array} \quad \begin{array}{c} | \\ u_2 \\ | \end{array} \quad \dots \end{array} \begin{array}{c} k \\ \left[\begin{array}{ccc} \sigma_1 & 0 & \dots \\ 0 & \sigma_2 & \dots \\ \vdots & \vdots & \ddots \end{array} \right] \end{array} \begin{array}{c} |V| \\ \left[\begin{array}{ccc} - & v_1 & - \\ - & v_2 & - \\ & \vdots & \end{array} \right] \end{array}$$