$$[y] = C \cdot [y]_C \qquad\qquad [x] = B \cdot [x]_B$$

$$[y] = A_\varphi [x]$$

$$C^{-1} C [y]_C = C^{-1} A_\varphi \cdot B \cdot [x]_B$$

$$[y]_C = \underbrace{C^{-1} A_\varphi B} \cdot [x]_B$$

$$A_{\varphi,(B,C)} = T$$

$$\boxed{A_{\varphi,(B,C)} = C^{-1} A_\varphi \cdot B}$$

$$\boxed{A_\varphi = C \cdot A_{\varphi,(B,C)} \cdot B^{-1}}$$

Унитарные матрицы

$$A^{-1} = A^T$$

$C \Rightarrow U$ унитарные

$B \Rightarrow V$

$$\forall A \in \mathbb{R}^{n\times m}$$

$$\boxed{A = USV^T}$$

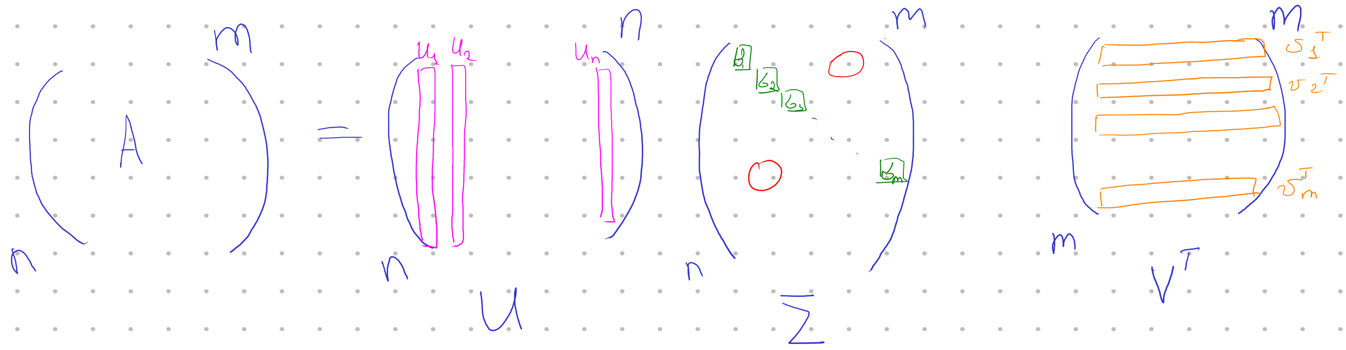
$$\Sigma \qquad \Sigma = A_{\varphi,(v,u)}$$

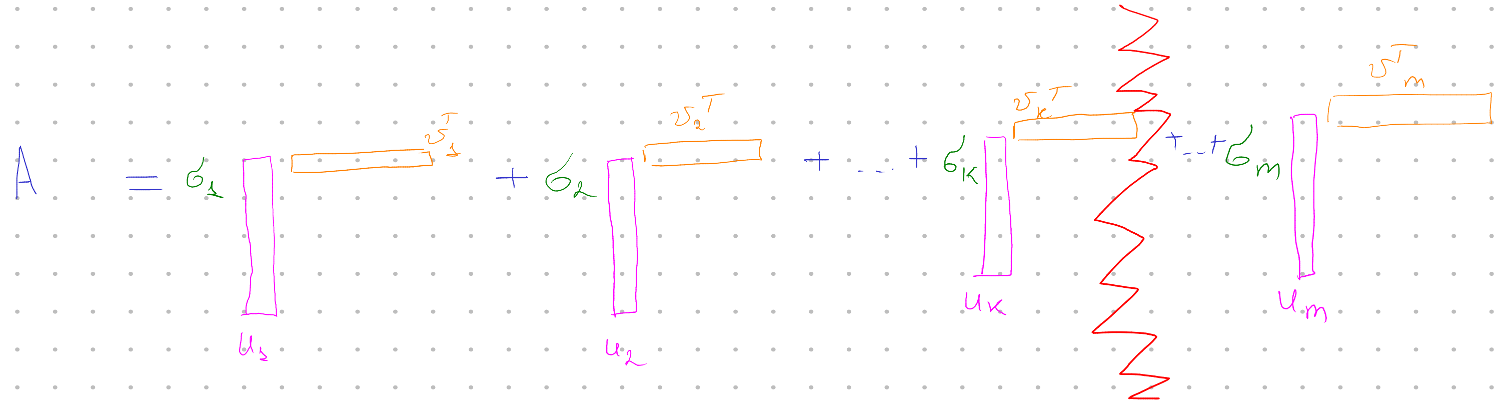
$$\Sigma = \begin{pmatrix} \sigma_1 & & & 0 \\ & \sigma_2 & & \\ & & \ddots & \\ 0 & & & \sigma_k \end{pmatrix}$$

$$\sigma_1 \geq \sigma_2 \geq \ldots \geq \sigma_k \geq 0$$

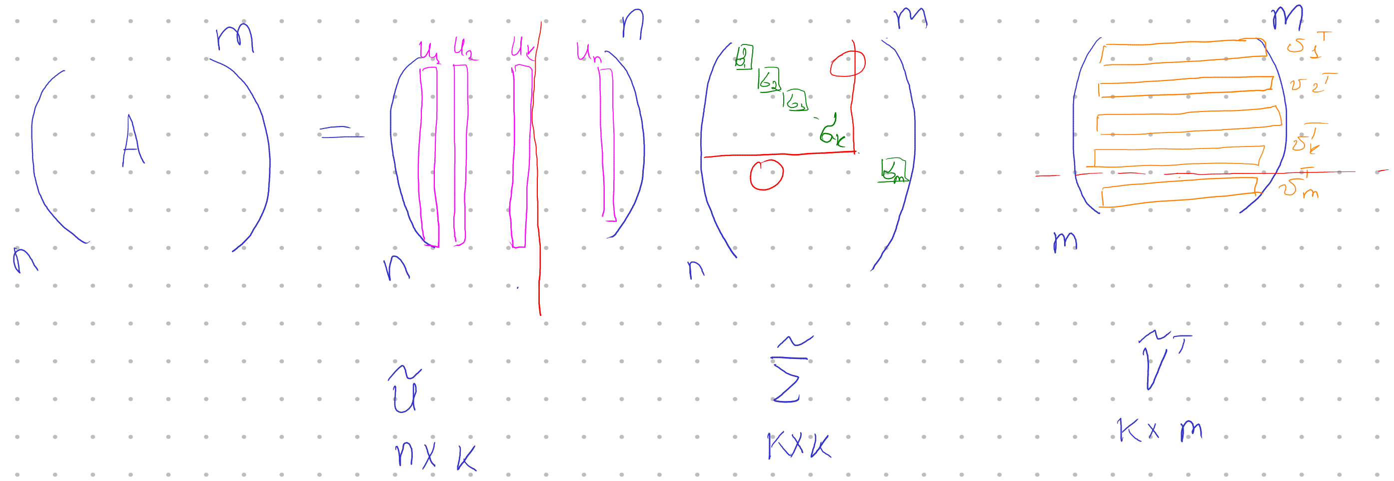
$$A = U\Sigma V^T, \quad n > m$$

$$\underset{n}{\overset{m}{\begin{pmatrix} \\ & A & \\ \\ \end{pmatrix}}} = \underset{U}{\underset{n}{\overset{n}{\begin{pmatrix} u_1 & u_2 & \cdots & u_n \end{pmatrix}}}} \underset{\Sigma}{\underset{n}{\overset{m}{\begin{pmatrix} \sigma_1 & & & 0 \\ & \sigma_2 & & \\ & & \ddots & \\ 0 & & & \sigma_m \\ \end{pmatrix}}}} \underset{V^T}{\underset{m}{\overset{m}{\begin{pmatrix} v_1^T \\ v_2^T \\ \vdots \\ v_m^T \end{pmatrix}}}}$$





$A \approx A_{approx} = \tilde{A} = \sum_{i=1}^{K} \sigma_i u_i v_i^T \quad , \quad k \leq m < n$



$\tilde{A} = \tilde{U} \tilde{\Sigma} \tilde{V}^T$