

$$\underline{Ax} = \underline{b}$$

$$\underbrace{\|Ax - b\|}_{\substack{\text{min} \\ \text{mod solution}}} = \Delta$$

$\Delta = 0$

$$x^* = A^+ b$$

$$\Delta = 0$$

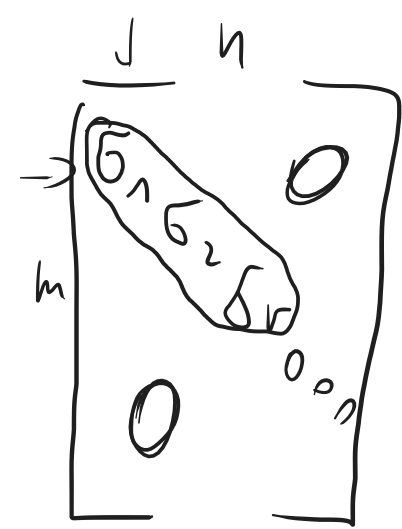
$$A^+ = A^{-1}$$

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

VALUE

DECOMPOSITION

$$A = P \cdot D \cdot Q^T = \begin{bmatrix} & m \\ & \end{bmatrix}$$



$$\begin{bmatrix} & n \\ & \end{bmatrix}_n$$

$$\sigma_1 \neq 0$$

$$\sigma_2 \neq 0$$

$$\vdots$$

$$\sigma_r \neq 0$$

$$r = \text{rank}(A)$$

$$\begin{cases} P^T P = I \\ Q^T Q = I \end{cases}$$

$$\begin{cases} P^T = P^{-1} \\ Q^T = Q^{-1} \end{cases}$$

$$X_N^T X_N \rightarrow \begin{bmatrix} & \\ & \\ & \end{bmatrix}$$

$$N = 100$$

$$A = \mathbb{R}^{4 \times 3}$$

$$A^+ = \mathbb{R}^{3 \times 4}$$

$$Y_N = \Phi_N \Theta + Z_N$$

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$\equiv 0$

$$\|Y_N - \Phi_N \Theta\| \rightarrow \min_{\Theta}$$

$$\hat{\Theta} = \Phi_N^+ Y_N$$

$$\Phi_N^+ = (\Phi_N^T \Phi_N)^{-1} \Phi_N^T$$