

$$A^T N^T A m = A^T N^T d$$

$N \Rightarrow \underline{I}$ for simplicity

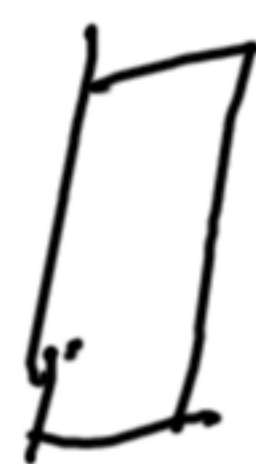
$$A^T A m = A^T d$$

SVD: $A = U S V^T$ U orthogonal
 S diagonal

V orthogonal

$$V^T V = I, U^T U = I$$

U rectangular

S square for 

$$A^T A = (U S V^T)^T (U S V^T) \quad (A^T V^T = B^T)$$

$$= V S U^T U S V^T$$

$$= V S^2 V^T = (U S V^T)^T d$$

$$= V S U^T d$$

$$V S^2 V^T = V S U^T d$$

\checkmark
 Eigen decomp. $A^T A$

S^2 makes cond. worse

$$V S^2 V^T m = V S u^T d$$

cancel V by V^T

$$\Rightarrow S^2 V^T m = S u^T d$$

cancel 1 S :

$$S V^T m = u^T d$$

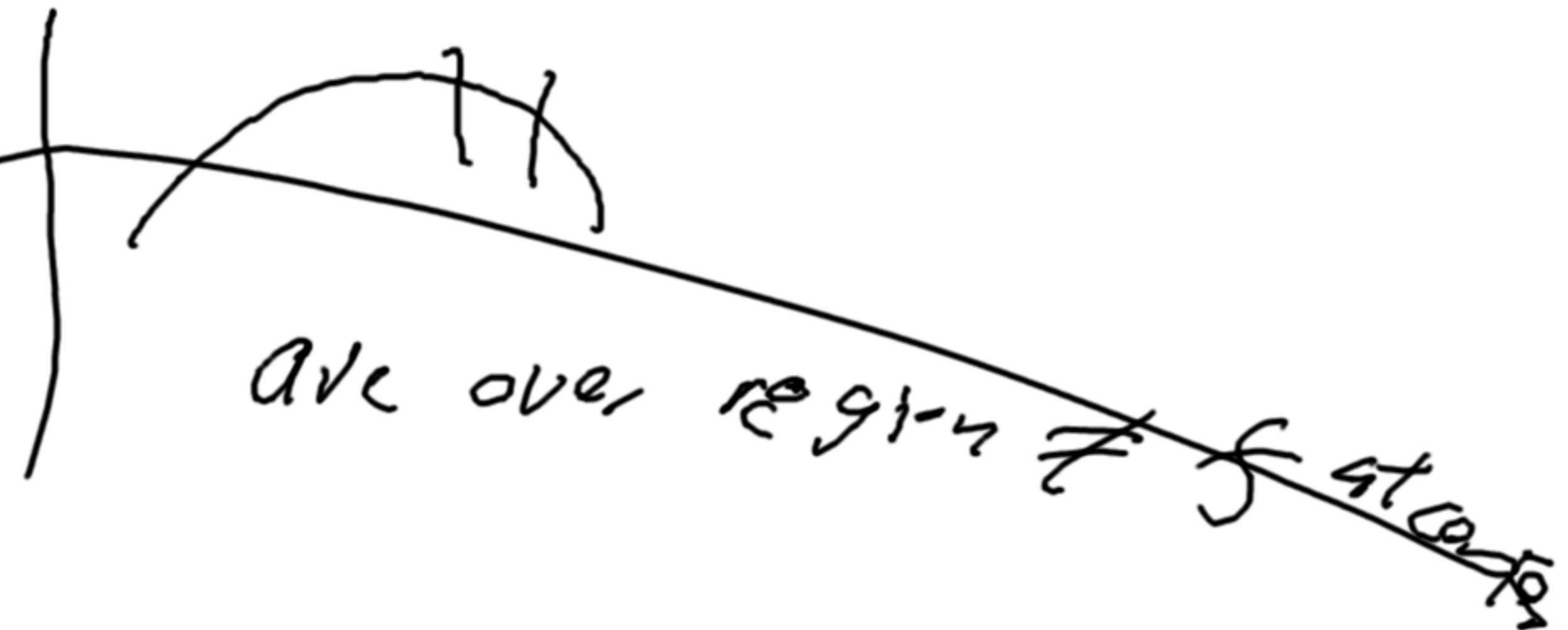
$$m = \underbrace{V S^{-1} u^T d}$$

$U S U^T$

hump: $A = U S V$
(not V^T)

qualitatively cancel one caps off
strongly encourage angle-lik
can callations!

QR



$$m = (A^T N^T A)^{-1} A^T N^T d \quad \langle d \rangle = A m_{true}$$

$$d = A m_t + \eta$$

$$\langle m - m_t \rangle$$

$$m_t = A^T N^T A^T A^T N^T d_{true}$$

$$\langle m - m_t \rangle = \underbrace{(A^T N^T A)^{-1} A^T N^T d}_{\text{true}} - \underbrace{A^T \dots d_{true}}$$

$$\langle \epsilon = (A^T N^T A)^{-1} A^T N^T \eta \rangle \quad 0 \text{ if } \hat{N} \text{ is affected by } m_t$$

$$\langle (m - m_t)(m - m_t)^T \rangle = \langle (A^T N^T A)^{-1} A^T N^T \eta \eta^T N^T A (A^T N^T A)^{-1} \rangle$$

$$\left(\langle \eta_i \eta_i \rangle = \sigma_i^2 \right. \\ \left. \begin{matrix} \sigma_1^2 & 0 & 0 \\ 0 & \sigma_2^2 & 0 \\ 0 & 0 & \sigma_3^2 \end{matrix} \right) = N$$

$$\underbrace{(A^T N^T A)^{-1}} \underbrace{A^T} \underbrace{N^{-1}} \underbrace{A} \underbrace{(A^T N^T A)^{-1}} \Rightarrow (A^T N^T A)^{-1}$$

$\langle A_m - d_{true} \rangle$

$A \langle m - m_{true} \rangle$

$$\langle \text{residual}^2 \rangle = A (A^T N^{-1} A)^{-1} A^T$$