$A^T N^{-1} A m = A^T N^{-1} d$

$N \Rightarrow I$ for simplicity

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

SVD: $A = USV^T$ U orthogonal

S diagonal

V orthogonal

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

U rectangular

S,V square for 

$A^T A = (USV^T)^T (USV^T)$ $(AB)^T = B^T A^T$

$= V S \cancel{U^T U} S V^T$

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

$= V S U^T d$

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

eigen decomp. $A^T A$

S^2 makes cond. worse

$VS^2V^Tm = VSU^Td$

cancel V w/ V^T

$\Rightarrow S^2V^Tm = SU^Td$

cancel 1 S:

$SV^Tm = U^Td$

$m = \underbrace{VS^{-1}U^T}d$

USV^T

numpy: $A = USV$ (not V^T)

analytically cancel all unnecessary

strongly encourage analytic

cancellations!

QR

ave over region $\neq f$ at center

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

$d = A m_t + n$

$\langle m - m_t \rangle$

$m_t = (A^T N^{-1} A)^{-1} A^T N^{-1} d_{true}$

$\langle m - m_t \rangle$

$m - m_t = \underbrace{(A^T)\ldots d} - \underbrace{A^T \ldots d_{true}}$

$\langle = (A^T N^{-1} A)^{-1} A^T N^{-1} n \rangle$ 0 iff $\hat{N}$ isn't effected by m_t

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

$\begin{pmatrix} \sigma_1^2 & & 0 \\ & \sigma_2^2 & \\ 0 & & \sigma_3^2 \end{pmatrix} = N$

$\langle n_i n_i \rangle = \sigma_i^2$

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

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

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

$\langle \mathrm{pred} - d \rangle^2 = A (A^T N^{-1} A)^{-1} A^T$