Office Hours

CMPE-240
10/FEB/2016

Practice Midterm

(3) (c) path from 13 → 17 does not go through node 3.

$B^k_{17,13} > 0$ ← find smallest k such that

$$B = A(\overset{r}{[1\ 2\ 4{:}20]}, \overset{c}{[1\ 2\ 4{:}20]});$$

$B^k(16,12) > 0$.

$$x_{k+1} = A x_k + B u_k \qquad x(0) = x_0$$

$$x_1 = A x_0 + B u_0$$

$$x_2 = A x_1 + B u_1 = A^2 x_0 + A B u_0 + B u_1$$

$$x_3 = A^3 x_0 + A^2 B u_0 + A B u_1 + B u_2$$

$$\vdots$$

$$x_{20} = A^{20} x_0 + A^{19} B u_0 + A^{18} B u_1 + \cdots + A B u_{18} + B u_{19}$$

$$\boxed{\underbrace{\begin{bmatrix} A^{19}B & A^{18}B & \cdots & AB & B \end{bmatrix}}_{\mathcal{C}} \begin{bmatrix} u_0 \\ \vdots \\ u_{19} \end{bmatrix} = -A^{20} x_0 .}$$

$$J_{smooth} = \left(\frac{1}{20} \sum_{k=0}^{19} \underbrace{(u_k - u_{k-1})}_{\delta}^2 \right)^{\frac{1}{2}}$$

$u(-1) = \phi$.

$\uparrow$

$\delta_0 = u_0$

$\delta_k = u_k - u_{k-1}$

$\delta_1 = u_1 - u_0$

$$u = \underbrace{\begin{bmatrix} 1 & 0 & \cdots & 0 \\ 1 & 1 & 0 \cdots & 0 \\ \vdots & \vdots & \ddots & 0 \\ \vdots & & & \\ 1 & \cdots & & 1 \end{bmatrix} \begin{bmatrix} \delta_0 \\ \vdots \\ \vdots \\ \delta_{19} \end{bmatrix}}_{F\,\delta}$$

$u_1 = \delta_1 + \delta_0$

$\delta_2 = u_2 - u_1$

$u = \delta_2 + u_1$

$= \delta_2 + \delta_1 + \delta_0$

$u =$

$$\mathcal{C} u = -A^{20} x_0$$

$$\underset{3\times 1}{|}$$

$$\underline{Ax = b}$$

$$u = F\delta$$

$$\underbrace{\mathcal{C} F}_{G} \delta = -\underbrace{A^{20} x_0}$$

$$J_{smooth} = \left(\frac{1}{20} \sum_{k=0}^{19} (u_k - u_{k-1})^2 \right)^{\frac{1}{2}} = \frac{1}{\sqrt{20}} \|\delta\|$$

$$\min \|\delta\|$$

$$\text{subj } G\delta = -A^{20} x_0$$

$$u = F\delta$$

$$\underline{u_{ln} = F\delta_{ln}}.$$

$\Delta x = y \qquad \Phi x = 0$

$$\begin{bmatrix} 1 & -1 & & \\ & \ddots & \ddots & \\ & & & \end{bmatrix} x$$

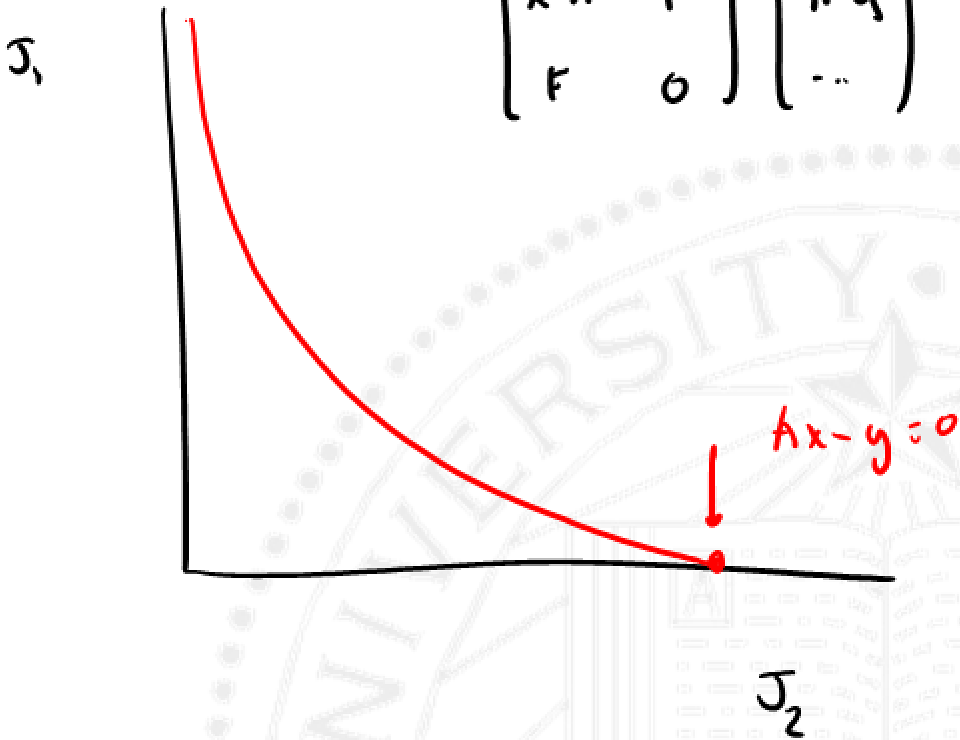
$$\begin{bmatrix} \quad \end{bmatrix}$$

$J_1 = \|\Phi x\|^2$

$\mu J_1 + \underline{J_2}$

$J_2 = \|\Delta x - y\|$

$$\begin{bmatrix} A^TA & F^T \\ F & 0 \end{bmatrix}^{-1} \begin{bmatrix} A^Ty \\ \cdots \end{bmatrix}$$

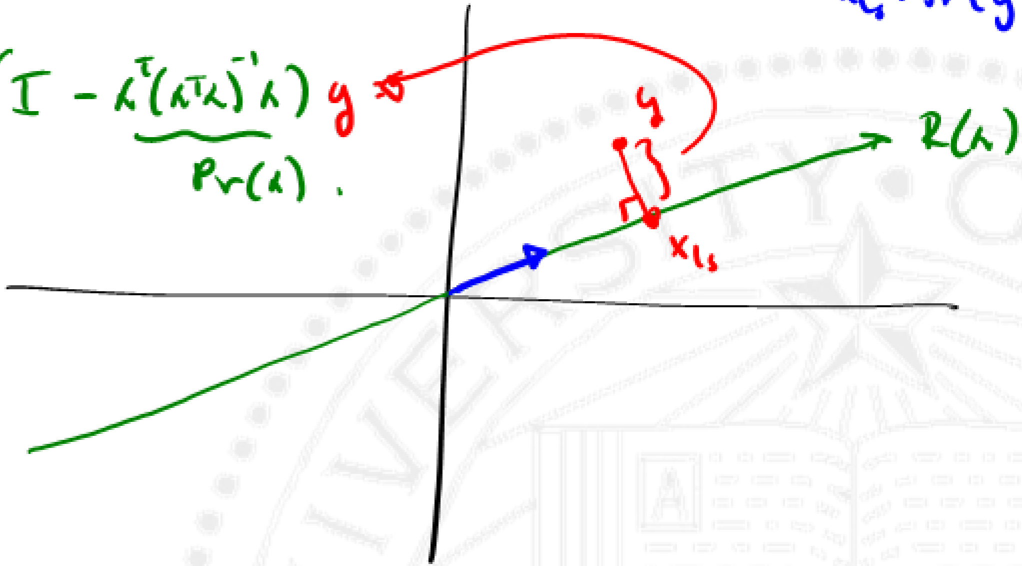


Generic Question

$y = Ax$

$x_{ls} = Pr(y)$ onto $R(A)$

$(I - \underbrace{A^T(A^TA)^{-1}A}_{Pr(A)})\,y$

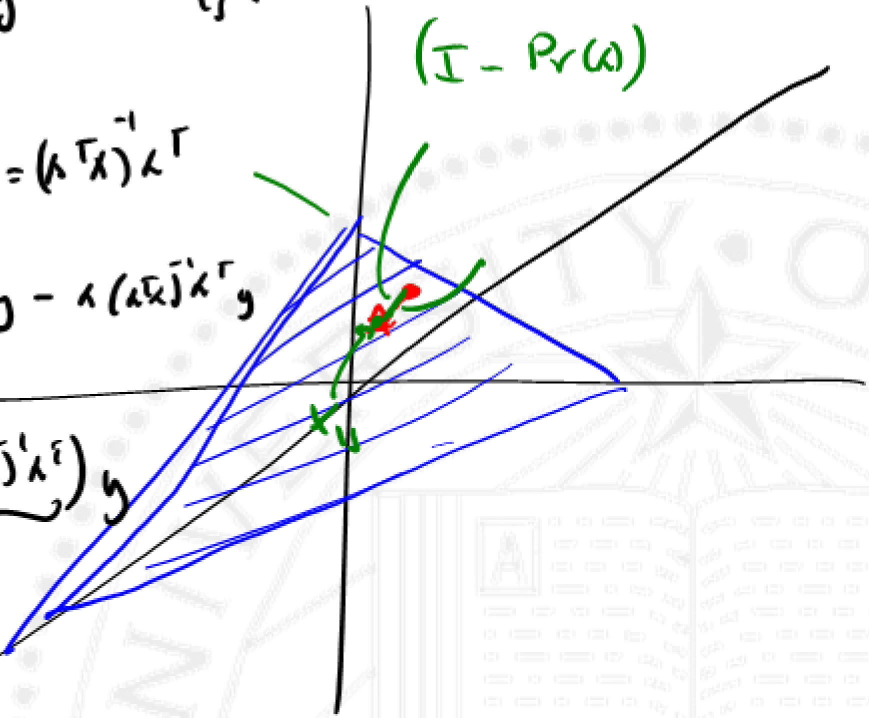


$Pr(A) \cdot y \to x_{ls}$.

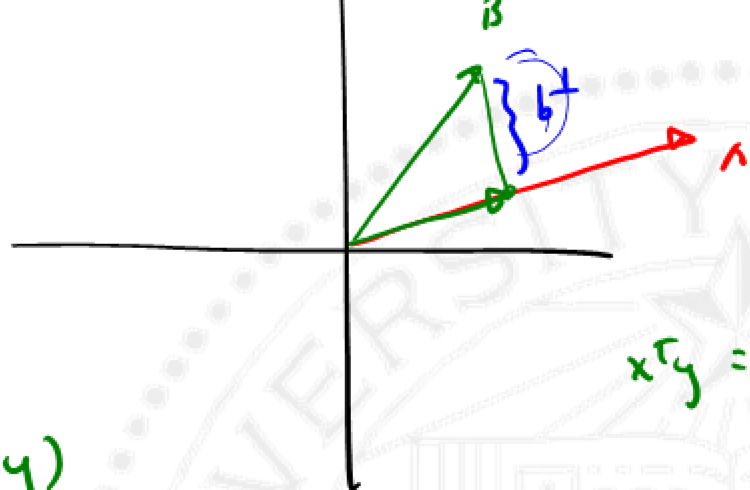
$y = Ax \quad x = (A^TA)^{-1}A^T$

$y - Ax_{ls} = y - A(A^TA)^{-1}A^T y$

$(\underbrace{I - A(A^TA)^{-1}A^T})\, y$



$(b - b^T a)$



$x^T y = 0 \ldots$

(x, y)

$(y - x^T y)$ is small   x & y are inline

$\|x\| - \|y\|$ small