Happy Halloween!

NSH 1507 5-7pm
Review Session (Ryan)

$$Ax = \begin{bmatrix} A_1 & \cdots & A_B \end{bmatrix} \begin{bmatrix} x_1 \\ \vdots \\ x_B \end{bmatrix} = \sum A_i x_i$$

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x^{t+1} $\min$ $L_\rho(x, u^t)$

$$\nabla f(x^{t+1}) + A^T u^t + \rho A^T [A x^{t+1} - b] = 0$$

$$\nabla f(x^{t+1}) + A^T [\underbrace{u^t + \rho(A x^{t+1} - b)}_{u^{t+1}}] = 0$$

$$\nabla f(x^{t+1}) + A^T u^{t+1} = 0$$

$\rightarrow$ $Ax^* = b$ $\quad$ $\nabla f(x^*) + A^T u^* = 0$

$\longrightarrow$ $A_1 x_1 + A_2 x_2 - b \longrightarrow 0$

$\rightarrow$ $\|x - b\|^2 + \underbrace{\|Fx\|_1}_{\{\sum |x_{i+1} - x_i|\}}$

$$\min_{x,z} \ \tfrac{1}{2}\|Ax-b\|_2^2 + \lambda\|z\|_1 + \rho u^T(Fx-z) + \tfrac{\rho}{2}\|Fx-z\|^2$$

$$x^{t+1}: \quad A^T(Ax^{t+1}-b) + \rho F^T u^t + \rho F^T(Fx^{t+1}-z^t) = 0$$

$$(A^TA+\rho F^TF)x^{t+1} = A^Tb + \rho F^T(z^t-u^t)$$

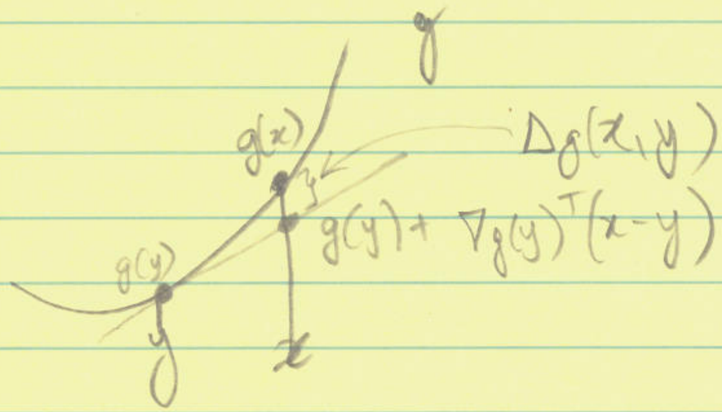
$$x^{t+1} = (A^TA+\rho F^TF)^{-1}(A^Ty)$$

$$z^{t+1}: \quad \lambda s - \rho u^t - \rho(Fx^{t+1} - z^{t+1}) = 0$$

$$z^{t+1} = Fx^{t+1} + u^t - \frac{\lambda s}{\rho}$$

$$u^{t+1}: \quad \rho u^{t+1} = \rho u^t + \rho\left[Fx^{t+1} - z^{t+1}\right]$$

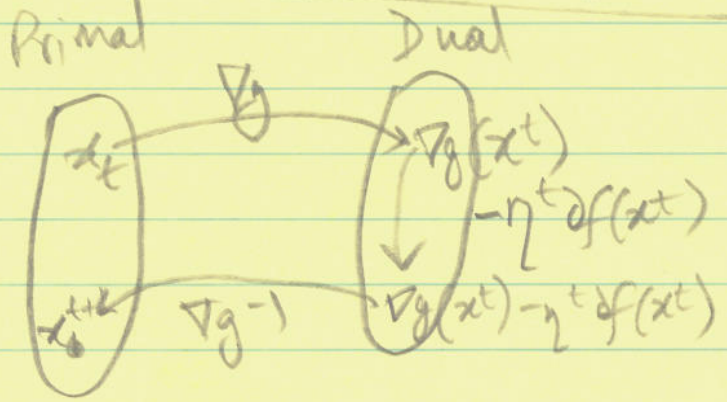
$$g(y) \geq g(x) + \nabla g_x^T(y-x) + \frac{\lambda}{2}\|y-x\|^2$$



$$\nabla_x(\Delta g(x,y)) = \nabla g(x) - \nabla g(y)$$

$$x^{t+1} = \arg\min_x \; \partial f(x^t)^T x + g(x) \cancel{- g(x^t)} + \nabla g(x^t)^T (x - x^t)$$

$$\nabla g(x^{t+1}) = \underline{\left[\nabla g(x^t) - \eta^t \partial f(x^t)\right]}$$



$$g(x) = \sum_i x_i \log x_i - x_i$$

$$\nabla g(x) = \log x$$

$$\nabla g(x^{t+1}) = \nabla g(x^t) - \eta^t \nabla f(x^t)$$

$$\log(\underline{x^{t+1}}) = \log(x^t) - \eta^t \nabla f(x^t)$$

$$x^{t+1} = x^t \circ \exp(-\eta^t \nabla f(x^t))$$

$$\min. \; \|Ax - b\|^2$$

$$\|x\|_1 \le c$$