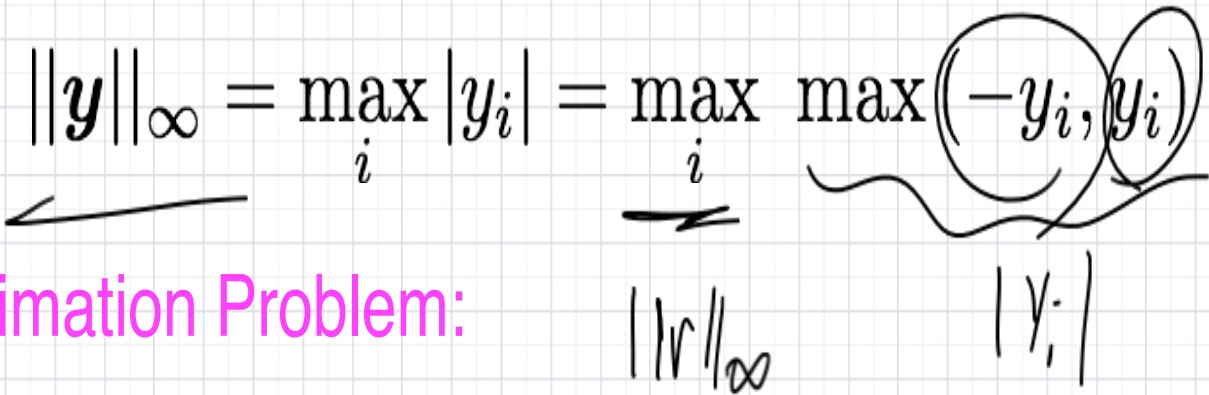


LP Equivalent: ℓ_∞ - Norm Approximation

- ℓ_∞ - Norm: $\|\mathbf{y}\|_\infty = \max_i |y_i| = \max_i \max(-y_i, y_i)$

- Fitting/Approximation Problem: $\|\mathbf{r}\|_\infty$ $|\mathbf{y}_i|$

$$\text{minimize } \|\mathbf{Ax} - \mathbf{b}\|_\infty$$

- LP Equivalent:

$$\begin{aligned} &\text{minimize } t \\ &\text{subject to } \begin{aligned} &\mathbf{Ax} - \mathbf{b} \leq t\mathbf{1} \\ &-(\mathbf{Ax} - \mathbf{b}) \leq \overline{t}\mathbf{1} \end{aligned} \end{aligned}$$

LP Equivalent: ℓ_∞ - Norm Approximation

minimize t
 subject to $Ax - b \leq t \mathbf{1}$ and $-(Ax - b) \leq t \mathbf{1}$

$\hat{x} = \begin{bmatrix} x \\ t \end{bmatrix}$

min $\begin{bmatrix} 0 & 1 \end{bmatrix}^T \begin{bmatrix} x \\ t \end{bmatrix}$

\hat{C}^T

$Ax - t \mathbf{1} \leq b$ (mistake)

$-Ax - t \mathbf{1} \leq -b$

$-Ax + b \leq t \mathbf{1}$

$\begin{bmatrix} A - \mathbf{1} \\ A - \mathbf{1} \end{bmatrix} \begin{bmatrix} x \\ t \end{bmatrix} \leq \begin{bmatrix} b \\ -b \end{bmatrix}$

$\min \|Ax - b\|_\infty$

LP Equivalent: ℓ_∞ - Norm Approximation

- Matrix Form:

$$\begin{array}{ll} \text{minimize} & \begin{bmatrix} \mathbf{0} & 1 \end{bmatrix}^T \begin{bmatrix} \mathbf{x} \\ t \end{bmatrix} \\ \text{subject to} & \begin{bmatrix} A & -\mathbf{1} \\ -A & -\mathbf{1} \end{bmatrix} \begin{bmatrix} \mathbf{x} \\ t \end{bmatrix} \leq \begin{bmatrix} \mathbf{b} \\ -\mathbf{b} \end{bmatrix} \end{array}$$