

## MÉTODO DE CHOLESKY

$$4x_1 - x_2 + 2x_4 = 6$$

$$-x_1 + 4x_2 - x_3 = 3$$

$$-x_2 + 4x_3 + x_4 = 16$$

$$2x_1 + x_3 + 3x_4 = 12$$

$$Ax = b$$

$$A = \begin{bmatrix} 4 & -1 & 0 & 2 \\ -1 & 4 & -1 & 0 \\ 0 & -1 & 4 & 1 \\ 2 & 0 & 1 & 3 \end{bmatrix} \quad b = \begin{bmatrix} 6 \\ 3 \\ 16 \\ 12 \end{bmatrix}$$

$$A = \begin{bmatrix} 4 & -1 & 0 & 2 \\ -1 & 4 & -1 & 0 \\ 0 & -1 & 4 & 1 \\ 2 & 0 & 1 & 3 \end{bmatrix}$$

$$A^T = \begin{bmatrix} 4 & -1 & 0 & 2 \\ -1 & 4 & -1 & 0 \\ 0 & -1 & 4 & 1 \\ 2 & 0 & 1 & 3 \end{bmatrix}$$

$$A = A^T \quad |A_1| = 4 \quad |A_2| = 16 - 1 = 15 \quad |A_3| = 64 - 8 = 56$$

$$|A_4| = 196 - 5 = 191$$

$$A = U^T$$

$$A = \begin{bmatrix} 4 & -1 & 0 & 2 \\ -1 & 4 & -1 & 0 \\ 0 & -1 & 4 & 1 \\ 2 & 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} a & 0 & 0 & 0 \\ b & e & 0 & 0 \\ c & f & h & 0 \\ d & g & i & j \end{bmatrix} = \begin{bmatrix} a & b & c & d \\ 0 & e & f & g \\ 0 & 0 & h & i \\ 0 & 0 & 0 & j \end{bmatrix}$$

$L \qquad L^T$

$$A = \begin{bmatrix} a^2 & ab & ac & ad \\ ba & b^2 + e^2 & be + ef & bd + eg \\ ca & cb + fe & c^2 + f^2 + h^2 & cd + fg + hi \\ da & db + ge & de + gf + ih & d^2 + g^2 + i^2 + j^2 \end{bmatrix} \quad \begin{matrix} a = 2 \\ b = -1/2 \\ c = 0 \\ d = 1 \end{matrix} \quad \begin{matrix} e = \frac{\sqrt{15}}{2} \\ f = -\frac{2\sqrt{15}}{15} \\ g = \frac{\sqrt{15}}{15} \\ h = \frac{2\sqrt{10}}{75} \end{matrix} \quad \begin{matrix} i = 0.3865 \\ j = 7.2608 \end{matrix}$$

$$a^2 = 4; a = \sqrt{4} = 2$$

$$fe = -1$$

$$ge = 0 + 1/2$$

$$h = 1 + 1/15$$

$$f = -1/\sqrt{15}/2$$

$$g = 1/2/\sqrt{15}/2$$

$$Ly = b$$

$$\begin{bmatrix} 2 & 0 & 0 & 0 \\ -1/2 & \sqrt{15}/2 & 0 & 0 \\ 0 & -2\sqrt{15}/15 & 2\sqrt{210}/15 & 0 \\ 1 & \sqrt{15}/15 & 0.5865 & 1.2606 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 16 \\ 12 \end{bmatrix}$$

$2y_1 = 0 \Rightarrow y_1 = 0$   
 $-1/2 y_1 + \sqrt{15}/2 y_2 = 3 \Rightarrow \sqrt{15} y_2 = 6 \Rightarrow y_2 = 6/\sqrt{15} = 2\sqrt{15}/5$   
 $-2\sqrt{15}/15 y_2 + 2\sqrt{210}/15 y_3 = 16 \Rightarrow -2\sqrt{15}/15 \cdot 2\sqrt{15}/5 + 2\sqrt{210}/15 y_3 = 16$   
 $-4/5 + 2\sqrt{210}/15 y_3 = 16 \Rightarrow 2\sqrt{210}/15 y_3 = 16 + 4/5 = 80/5 + 4/5 = 84/5$   
 $y_3 = \frac{84/5 \cdot 15}{2\sqrt{210}} = \frac{84 \cdot 3}{\sqrt{210}} = \frac{252}{\sqrt{210}} = \frac{252\sqrt{210}}{210} = \frac{12\sqrt{210}}{10} = \frac{6\sqrt{210}}{5} \approx 1.0027$   
 $y_1 + \sqrt{15}/15 y_2 + 0.5865 y_3 + 1.2606 y_4 = 12$

$$y_1 = 0 \quad y_2 = 2\sqrt{15}/5 \quad y_3 = 1.0027 \quad y_4 = \frac{\sqrt{15}}{2}$$

$$L^T x = y$$

$$\begin{bmatrix} 2 & -1/2 & 0 & 1 \\ 0 & \sqrt{15}/2 & -2\sqrt{15}/15 & \sqrt{15}/15 \\ 0 & 0 & 2\sqrt{210}/15 & 0.5862 \\ 0 & 0 & 0 & 1.2606 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 2\sqrt{30}/15 \\ -1 \\ 1.0027 \\ \sqrt{15}/2 \end{bmatrix}$$

