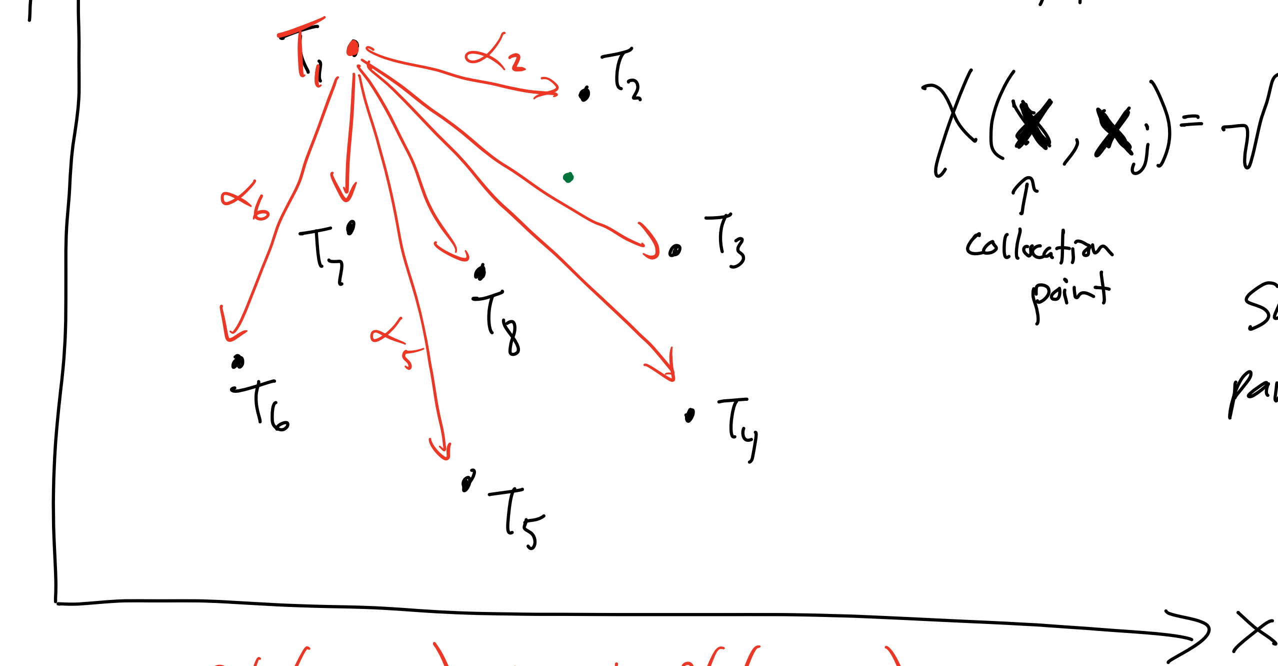
$N=8$ $\qquad T(x,y)$

$$T = \sum_{j=1}^{N} \alpha_j X_j$$



$$X(\mathbf{x}, \mathbf{x}_j) = \sqrt{1 + \frac{|r|^2}{\mathbf{c}}}$$

collocation point

Shape parameter

$$T_1 = \alpha_1 X(x_1, x_1) + \alpha_2 X(x_1, x_2) + \alpha_3 X(x_1, x_3) \dots$$

$$T_2 = \alpha_1 X(x_2, x_1) + \alpha_2 X(x_2, x_2) + \dots$$

$$T_3 =$$

$$\left\{ T \right\} = \overset{X}{\begin{bmatrix} X(x_1,x_1) & X(x_1,x_2) & \cdots \\ X(x_2,x_1) & X(x_2,x_2) & \\ & & \ddots \end{bmatrix}} \left\{ \alpha \right\}$$

$$\mathbf{C}\boldsymbol{\alpha} = \mathbf{T}$$

Matrix form

$$\underline{\boldsymbol{\alpha} = \mathbf{C}^{-1}\mathbf{T}}$$

$$\mathbf{T} \qquad \mathbf{C} \qquad \boldsymbol{\alpha}$$

$\underline{\text{cond}(\mathbf{C})}$

$c \uparrow$ $\qquad$ accuracy $\uparrow$ $\qquad \uparrow$ conditioning Num of $\mathbf{C}$ $\qquad 10^{10}$

$\frac{\partial}{\partial x}(T) = \frac{\partial}{\partial x}\left(\sum \alpha \chi\right)$ $\qquad$ $\frac{\partial \chi}{\partial x} = \cdots$

$\frac{\partial T}{\partial x} = \sum \alpha \frac{\partial \chi}{\partial x} \rightarrow$ $\qquad$ $\frac{\partial}{\partial x} \rightarrow \mathbf{L}$

$\mathbf{L}T \rightarrow \frac{\partial T}{\partial x}$

$\mathbf{L}T = L\chi^{\mathbf{T}}\boldsymbol{\alpha}$

same alpha as above

$\underline{L}T = \underbrace{L\chi^{T} C^{-1}}_{\mathbf{L}^{T}}\mathbf{T}$

$LT = L^{T} T \Leftarrow$ node values

derivative of T

pre-computed vector