One distinguishes :

(linear) $\quad A\vec{x} = \vec{b} \quad , A \in \mathbb{R}^{m\times n}, \vec{b} \in \mathbb{R}^m$

(nonlinear) $\quad \vec{f}(\vec{x}) = \vec{b} \quad , \vec{f} : D \subset \mathbb{R}^n \to \mathbb{R}^m$

$\vec{x} = \begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix}$ vector of unknown parameters

However, these equations do in general not admit a solution in the common sense. Instead one looks for so-called least-squares solutions

(linear) $\quad \min_{\vec{x} \in D} \| A\vec{x} - \vec{b} \|_2 = \|\vec{r}\|_2$

(nonlinear) $\quad \min_{\vec{x} \in D} \| \vec{f}(\vec{x}) - \vec{b} \|_2 = \|\vec{r}\|_2$

where $\quad D$ ... admissible parameter domain

$\|\_\|_2$ ... Euclidean norm $\quad \|\vec{x}\|_2 = \sqrt{x_1^2 + \ldots + x_n^2}$

$= \sqrt{\vec{x}^T \vec{x}}$ transpose

$\|\vec{r}\|_2$ ... residual

So one minimizes the deviation

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