Least square

$Ax=b \quad x \in \mathbb{R}^n, \; b \in \mathbb{R}^m \quad A \in \mathbb{R}^{m \times n}$

$m > n$ (more equations than vigribles)

$m\,\overset{n}{\boxed{A}}\,\boxed{x}^{n} = \boxed{B}^{m}$ Solve x $\quad x_{LS} = \underset{x}{\arg\min} \|Ax-b\|^2$ least square

~~set~~ derivetive $\|Ax-b\|^2$ should be zero **solved! but---**

Solve $\Rightarrow$ $A^TAx_{LS} = A^Tb$

$x_{LS} = (A^TA)^{-1}A^Tb \quad \boxed{A^T}\boxed{A} = \boxed{A^TA}$

Linear algibra — useful tool to solve multiple variables with multiple equations

For EIT

~~$\boxed{A}$ is horribly long since~~

Inverting A^TA is problamatic since the condition ~~numbe~~ number of A^TA is big (ill-posed) (many solutions to a same measument)

That is where regularization can help: (filter out abnormal solutions)

$x_{Tik} = \underset{x}{\arg\min} \|Ax-b\|^2 + \alpha^2\|Lx\|^2$ penal~~ize~~ize large x

(Tikhonov regularization).

This is the same as assuming no single pixel of conductivity pixel will be significantly bigger the the neighboring pixels.

So L takes difference of neigbors.

In the end $x_{Tik} = (A^TA + \alpha^2L^TL)^{-1}A^Tb$ makes it better conditioned

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