Compressed Sensing

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1 Overview

Short overwiew of matrix completion:

$$\min ||X||_* \quad s.t. \quad AX = B$$

We need to find the min rank X such that $AX = B$

2 Douglas- Rachford Splitting

In the noiseless case we can use DRS to solve this numerically via a fixed-point iteration:

$$z^{(k+1)} = z^{(k)} + Prox_{\gamma g}\Big(2Prox_{\gamma f}(z^{(k)}) - z^{(k)}\Big) - Prox_{\gamma g}(z^{(k)})$$

We know that for $f = \delta_C$ with $C = \{X|AX = B\}$ we obtain

$$\begin{aligned} Prox_{\gamma f}(x) = \Pi_C(x) &= x + A^+(b - Ax) \\ &= x + A^T(AA^T)^{-1}(b - Ax) \\ &= x + A^T(b - Ax) \end{aligned}$$

and via the SVD

$$\begin{aligned} Prox_{\gamma g}(x) &= US_\delta(\sigma(x))V^T \\ &= U(\sigma(x) - \gamma)_+V^T \end{aligned}$$