Hybrid projection methods with data driven covariance matrices for large-scale inverse problems

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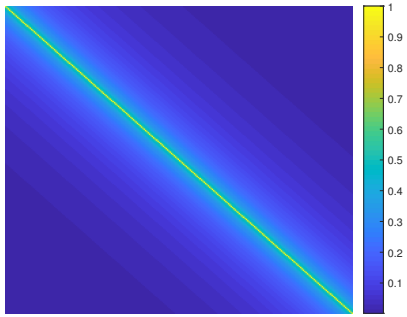
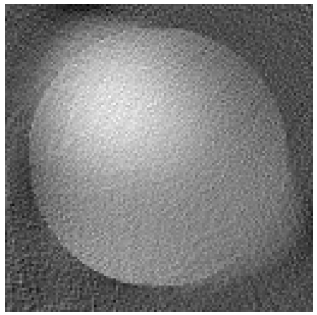
Prior Covariance matrices for inverse problem

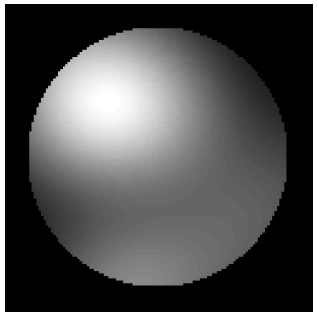
- Sharp Prior Covairance



(a) Q_1



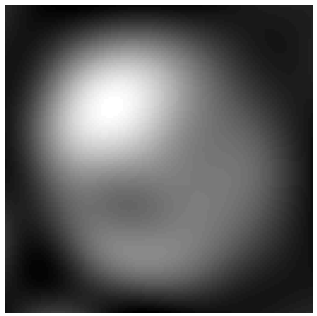
(b) Reconstruction



(c) True

- Smooth Prior Covariance

(d) Q_2



(e) Reconstruction

Q_1, Q_2 together?

- Instead of a single prior covariance, consider a weighted sum of covariances,

$$\omega Q_1 + (1-\omega) Q_2$$

- Get prior covariance matrices from training set
- Regularization parameter λ
- By Generalized Golub-Kahan method and additional QR factorization, find ω and λ in subspace.
- Compare numerical results with hybrid methods and shrinkage method.

Thank you!