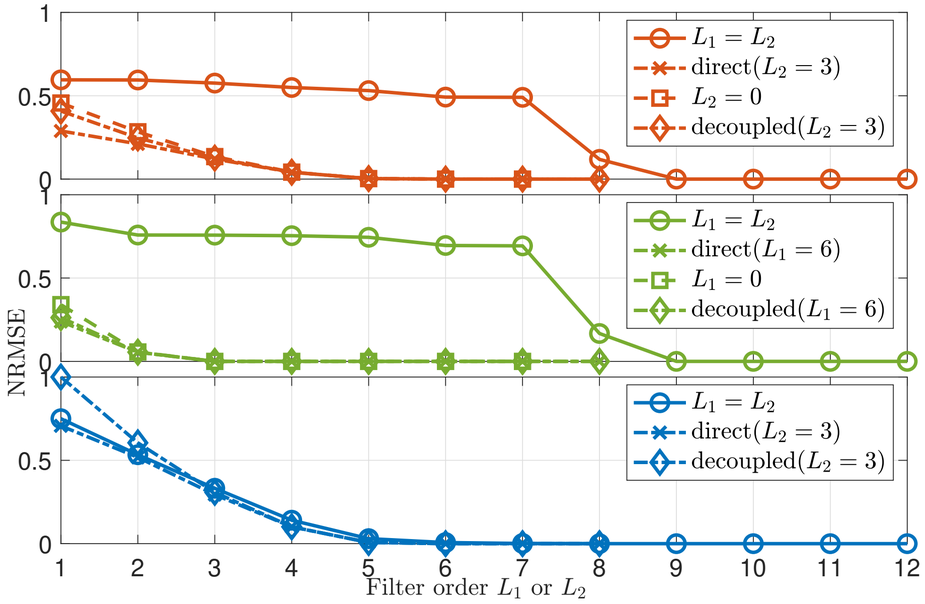
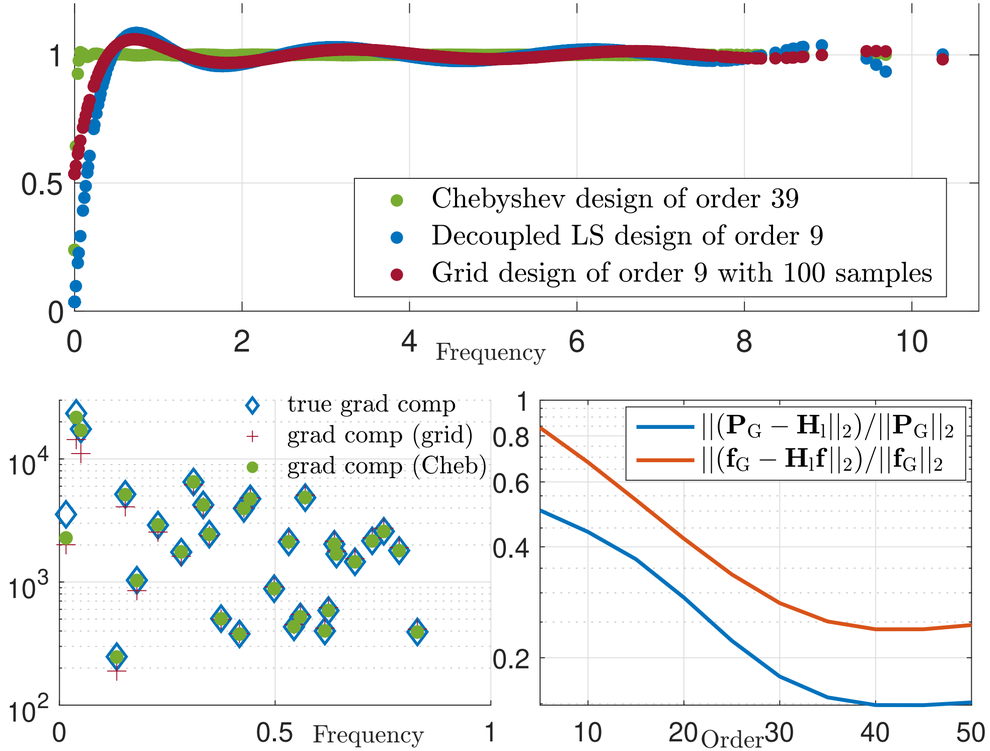
Applications

Gradient projection op.
$\mathbf{P}_{\mathrm{G}} = \mathbf{B}_1^{\top}(\mathbf{B}_1\mathbf{B}_1^{\top})^{\dagger}\mathbf{B}_1 = \mathbf{U}_{\mathrm{G}}\mathbf{U}_{\mathrm{G}}^{\top}$

- Hodge component extractions
- Solving LS problem: $\mathbf{f}_{\mathrm{G}} = \mathbf{P}_{\mathrm{G}}\mathbf{f}$, $\mathbf{f}_{\mathrm{C}} = \mathbf{P}_{\mathrm{C}}\mathbf{f}$, $\mathbf{f}_{\mathrm{H}} = \mathbf{f} - \mathbf{f}_{\mathrm{G}} - \mathbf{f}_{\mathrm{C}}$
- Convolutional filter implementation: closed form on coefficients

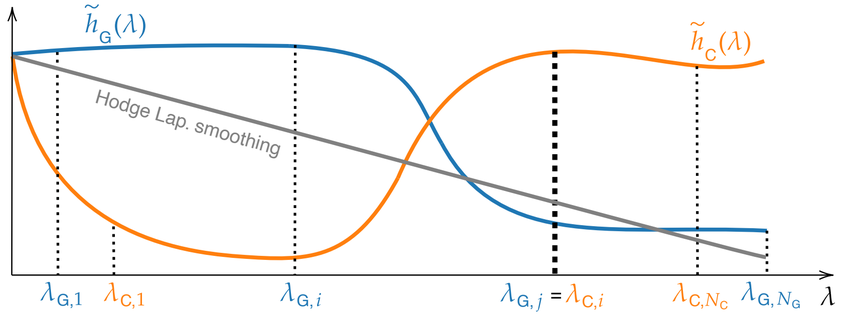




Convolutional Learning on SCs

Linear

$$\mathbf{H} := \mathbf{H}(\mathbf{L}_{\mathrm{d}}, \mathbf{L}_{\mathrm{u}}; \boldsymbol{\alpha}, \boldsymbol{\beta}) = \sum_{k=0}^{K_{\mathrm{d}}} \alpha_k \mathbf{L}_{\mathrm{d}}^k + \sum_{k=0}^{K_{\mathrm{u}}} \beta_k \mathbf{L}_{\mathrm{u}}^k$$



Non-Linear