

APPROXIMATED PRECONDITIONING STRATEGY FOR A NESTED PRIMAL–DUAL SCHEME

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Proximal gradient methods are widely used in imaging, and their convergence can typically be accelerated by incorporating variable metrics and/or extrapolation steps. Recently, it has been shown [1, 2] that preconditioning strategies can further enhance the acceleration of such methods, especially when the proximal operator is computed inexactly via a nested primal-dual solver. However, the computational cost of preconditioning can become significant, particularly for large-scale problems where no exploitable structure is available.

In this talk, we present several approximation strategies for efficiently preconditioning a nested primal-dual method designed to solve regularized convex optimization problems. Numerical experiments in both image deblurring and computed tomography (CT) with total variation regularization confirm that our strategies accelerate convergence while keeping the per-iteration computational cost low.

References

- [1] S. Aleotti, M. Donatelli, R. Krause, G. Scarlato, *A Preconditioned Version of a Nested Primal-Dual Algorithm for Image Deblurring*, Journal of Scientific Computing, (2025).
- [2] S. Aleotti, S. Bonettini, M. Donatelli, M. Prato, and S. Rebegoldi, *A Nested Primal–Dual Iterated Tikhonov Method for Regularized Convex Optimization*, Computational Optimization and Applications, (2024).