

# NUMERICAL ANALYSIS AND SCIENTIFIC COMPUTING SEMINAR

## *Regularization by Krylov Subspace Methods*

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**Abstract:** Iterative methods have always played a central role in the regularization of large-scale linear discrete ill-posed problems. These kind of problems arise in a variety of scientific and engineering applications: we are particularly interested in the image deblurring and denoising issues.

Historically, the first Krylov subspace methods to be extensively used with regularization purposes were the CGLS and the LSQR methods. In the last three decades, many other Krylov subspace methods have been analyzed and employed to solve linear discrete ill-posed problems and, very recently, some modifications of the usually involved Krylov subspaces have been proposed: we cite the smoothing preconditioning, the augmentation, and the range-restricted techniques. In addition to a purely iterative approach to regularization, some hybrid methods have also been derived: hybrid methods merge an iterative and a variational (Tikhonov-like) approach to regularization.

The purpose of this talk is to survey some classical iterative regularization methods and to present some original ones, comparing their performance on some meaningful test problems. Particular emphasis will be posed on the hybrid methods and on the strategies to be employed to set the regularization parameters.

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