

# A MODIFIED TSVD METHOD FOR DISCRETE ILL-POSED PROBLEMS

L. Reichel, **S. Noschese**

Department of Mathematical Sciences, Kent State University  
Kent, OH 44242, USA

`reichel@math.kent.edu`

Dipartimento di Matematica, SAPIENZA Università di Roma  
P.le A. Moro, 2, I-00185 Roma, Italy

`noschese@mat.uniroma1.it`

Truncated singular value decomposition (TSVD) is a popular method for solving linear discrete ill-posed problems with a small to moderately sized matrix  $A$ . Regularization is achieved by replacing the matrix  $A$  by its best rank- $k$  approximant, which we denote by  $A_k$ . The rank may be determined in a variety of ways, e.g., by the discrepancy principle or the L-curve criterion. In this talk, we present a novel regularization approach, in which  $A$  is replaced by the closest matrix in a unitarily invariant matrix norm with the same condition number as  $A_k$ . Numerical examples illustrate that this regularization approach often yields approximate solutions of higher quality than the replacement of  $A$  by  $A_k$ .