

1 A Newton Iteration for estimating the regularizing parameter for discrete ill-posed systems

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Recently, Mead showed that a statistical result on the χ^2 -distribution of the Tikhonov cost functional for least squares problems can be used for estimating an optimal regularizing parameter. Here we explain the background and development of a Newton iteration from which the regularizing parameter can be efficiently and effectively found. We contrast the Newton iteration with and without solution using the Generalized Singular Value Decomposition, hence demonstrating that one can efficiently find solutions without the GSVD. At each Newton step a solution of the regularized problem needs to be found for the current value of the regularization parameter. We also investigate the sensitivity of the solution to the accuracy of calculating these intermediate steps of the Newton iteration, hence demonstrating that the overall ideal regularization parameter can be obtained without significant overhead as compared to one solution of the given problem.