
Victor, Y. Pan
Additive preconditioning in matrix computations

Math and Computer Science Dept
Lehman College
CUNY
Bronx
NY 10468 USA
`vpan@lehman.cuny.edu`

Multiplicative preconditioners are popular for solving linear systems of equations. We introduce additive preconditioners, which are more robust and more readily available. By combining them with aggregation processes, we obtain preconditioners that are nearly as effective as SVD-based multiplicative preconditioners. Besides simplifying and stabilizing the generation of such preconditioners, this technique also preserves the structure of the input matrices, and we also employ it for numerical computation of the sign of the matrix determinant. Our alternative techniques employ additive preconditioners for computing null vectors and null space bases for a singular matrix, and we extend this approach to yield alternative linear solvers and to compute the tails of the SVDs of ill conditioned matrices and matrix eigenvectors. We support our approach with extensive analysis and numerical experiments.