

ACHIEVING SCALABILITY WITH A HERMITIAN PRECONDITIONER FOR A CLASS OF
NON-HERMITIAN MATRICES

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This work considers the convergence of GMRES for non-singular problems. Preconditioning and weighted norms within GMRES are considered.

The main focus is on Hermitian preconditioning (even for non-Hermitian problems). It is proposed to choose a Hermitian preconditioner H and to apply GMRES in the inner product induced by H . If moreover, the problem matrix A is positive definite, then a new convergence bound is proved that depends only on how well H preconditions the Hermitian part of A , and on how non-Hermitian A is.

In particular, if a scalable preconditioner is known for the Hermitian part of A , then the proposed method is also scalable. This result is illustrated numerically.

Reference: Nicole Spillane. Hermitian Preconditioning for a class of Non-Hermitian Linear Systems. 2023. <https://hal.science/hal-04028590v1/document>