

Randomized V-AISM preconditioner**Authors:**

- Rafael Bru, Universitat Politècnica de València (rbru@imm.upv.es)
- Juana Cerdán, Universitat Politècnica de València (jcerdan@imm.upv.es)
- José Marín, Universitat Politècnica de València (jmarinma@imm.upv.es)
- José Mas, Universitat Politècnica de València (jmasm@imm.upv.es)

Abstract: In this work we consider the application of randomized approximate inverse LU preconditioners for solving iteratively linear systems of the form $Ax = b$ where $A \in \mathbb{R}^{n \times n}$ is a large nonsymmetric and sparse nonsingular matrix. We solve the system using Krylov subspaces methods.

The preconditioner is a randomized version of the V-AISM preconditioner introduced in [2] which is a variant of the AISM preconditioner [1]. In this new approach the matrix products used to compute the preconditioner are approximated as the product of some randomly selected rows and columns of the matrices to be multiplied.

Acknowledgements Supported by Conselleria de Innovació, Universitats, Ciència i Societat Digital, Generalitat Valenciana (CIAICO/2021/162).

References:

- [1] Bru, R., Cerdán, J., Marín, J. and Mas, J., Preconditioning sparse nonsymmetric linear systems with the Sherman–Morrison formula. *SIAM J. on Sci. Comput.*, 25: 701–715 (2003).
- [2] Bru, R., Cerdán, J., Marín, J. and Mas, J., An inverse LU preconditioner based on the Sherman-Morrison formula *Analele Stiintifice ale Universitatii Ovidius Constanta, Volume 32(1):105–126 (2024)*. DOI: 10.2478/auom-2024-0006.
- [3] Hager, W. W., Updating the inverse of matrix. *SIAM Rev.*, 31(2): 221–239, 1989.
- [4] Sherman, J. and Morrison, W. J., Adjustment of an inverse matrix corresponding to a change in one element of a given matrix. *Ann. Math. Statist.*, 21, 124–127, 1950.