IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, March 2026
Impact Factor: 8.2

Matrix Decomposition Techniques in Linear Algebra

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Abstract: *Matrix decomposition techniques are fundamental tools in Linear Algebra that enable complex matrices to be represented as products of simpler matrices. These techniques play a crucial role in simplifying mathematical computations and improving the efficiency of numerical algorithms used in various scientific and engineering applications. By decomposing a matrix into structured components such as triangular, orthogonal, or diagonal matrices, it becomes easier to solve systems of linear equations, compute matrix inverses, and analyze matrix properties. Several decomposition methods, including LU decomposition, QR decomposition, eigenvalue decomposition, Singular Value Decomposition, and Cholesky decomposition, provide different approaches for transforming matrices into forms that are computationally convenient and mathematically insightful.*

Keywords: *Matrix Decomposition, Linear Algebra, LU Decomposition, QR Decomposition, Singular Value Decomposition, Eigenvalue Decomposition, Cholesky Decomposition, Numerical Methods*

DOI: 10.48175/568