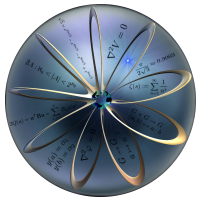

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matrix factorization

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Matrix Factorization

A *matrix factorization* (or *matrix decomposition*) is the right-hand-side product in

$$A = F_1 F_2 \dots F_k$$

for "input" matrix A. The number of factor matrices k depends on the situation. Most often, $k = 2$ or $k = 3$.

Note that the process of *producing* a factorization/decomposition is also called "factorization" or "decomposition".

Examples

Some common factorizations and related devices are:

- LU-decomposition: $A = LU$, where L is lower triangular, and U is upper triangular
- QR-decomposition: $A = QR$, where Q is orthogonal, and R is right triangular.
- Singular value decomposition (SVD): $A = USV^T$, where U and V are orthogonal, and S is a partially diagonal matrix.
- The Cholesky Decomposition.
- For a positive definite matrix, we can decompose it into its `http://planetmath.org/SquareR` root squared.
- Polar decomposition
- Jordan canonical form
- Iwasawa decomposition

See the entries for these and other matrix factorizations for details on the contents of the factor matrices, where to apply them, and how to best calculate them.

Simultaneous matrix factorization

A related problem is to diagonalize or tridiagonalize many matrices using the same matrix. Some results in this direction are listed below:

- commuting matrices are simultanenously triangularizable
- commuting normal matrices are simultanenously diagonalizable