

**Eldén, Lars**

**Matrix methods in data mining and pattern recognition.** (English) Zbl 1120.68092  
*Fundamentals of Algorithms* 4. Philadelphia, PA: Society for Industrial and Applied Mathematics (SIAM) (ISBN 978-0-898716-26-9). x, 224 p. (2007).

The book is concerned with the presentation of several very powerful numerical linear algebra techniques for solving problems in different areas of data mining and pattern recognition. It has three parts. The first one presents in 9 chapters the necessary concepts of linear algebra and matrix decompositions such as: linear systems and least squares, orthogonality, QR, singular values and tensor decompositions, clustering and nonnegative matrix factorization. They give the students the possibility of using matrix decompositions in problem-solving environments such as MATLAB. Part two of the book is dedicated to applications in data mining and pattern recognition. In Chapters 10 to 14 the author presents some problem areas that are well suited for linear algebra techniques such as: text mining, page ranking for web search engines, key word and sentence extraction, face recognition. The presentation contains relevant examples and MATLAB applications. In Part III, the author comes back to numerical linear algebra and gives some basic information about eigenvalue and singular value algorithms such as: power method, inverse iteration, QR algorithm for symmetric matrices, the nonsymmetric eigenvalue problem, Arnoldi and Lanczos algorithms.

The book is primarily intended for undergraduate students who have previously taken an introductory scientific computing/numerical analysis course, but also for early graduate students in various data mining and pattern recognition areas who need an introduction to linear algebra techniques. In this sense, it gives the students a set of basic tools which can easily be modified and adapted to become useful for a particular application. A collection of exercises and computer assignments are available at the book's Web page: <http://www.siam.org/books/fa04>.

Reviewer: [Constantin Popa \(Constanța\)](#)

**MSC:**

- 68T10 Pattern recognition, speech recognition
- 68T05 Learning and adaptive systems in artificial intelligence
- 68-01 Introductory exposition (textbooks, tutorial papers, etc.) pertaining to computer science
- 65F10 Iterative numerical methods for linear systems
- 65F15 Numerical computation of eigenvalues and eigenvectors of matrices
- 65F25 Orthogonalization in numerical linear algebra
- 68U10 Computing methodologies for image processing
- 68U15 Computing methodologies for text processing; mathematical typography
- 65Y15 Packaged methods for numerical algorithms

Cited in **1** Review  
Cited in **34** Documents

**Keywords:**

textbook; linear systems; least squares problems; matrix decompositions; eigenvalues; singular values; QR algorithms; data mining; pattern recognition

**Software:**

ARPACK; JDQR; JDQZ; LAPACK; Mathematica; Matlab; mctoolbox