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Nota di contenuto	Preface -- Part I: Introductory and Preparatory Topics -- 1. Introduction -- 2. Rank-r Matrices -- 3. Introductory Example -- 4. Separable Expansions and Low-Rank Matrices -- 5. Matrix Partition -- Part II: H-Matrices and Their Arithmetic -- 6. Definition and Properties of Hierarchical Matrices -- 7. Formatted Matrix Operations for Hierarchical Matrices -- 8. H2-Matrices -- 9. Miscellaneous Supplements -- Part III: Applications -- 10. Applications to Discretised Integral Operators -- 11. Applications to Finite Element Matrices -- 12. Inversion with Partial Evaluation -- 13. Eigenvalue Problems -- 14. Matrix Functions -- 15. Matrix Equations -- 16. Tensor Spaces -- Part IV: Appendices -- A. Graphs and Trees -- B. Polynomials -- C. Linear Algebra and Functional Analysis -- D. Sinc Functions and Exponential Sums -- E. Asymptotically Smooth Functions -- References -- Index.

Sommario/riassunto

This self-contained monograph presents matrix algorithms and their analysis. The new technique enables not only the solution of linear systems but also the approximation of matrix functions, e.g., the matrix exponential. Other applications include the solution of matrix equations, e.g., the Lyapunov or Riccati equation. The required mathematical background can be found in the appendix. The numerical treatment of fully populated large-scale matrices is usually rather costly. However, the technique of hierarchical matrices makes it possible to store matrices and to perform matrix operations approximately with almost linear cost and a controllable degree of approximation error. For important classes of matrices, the computational cost increases only logarithmically with the approximation error. The operations provided include the matrix inversion and LU decomposition. Since large-scale linear algebra problems are standard in scientific computing, the subject of hierarchical matrices is of interest to scientists in computational mathematics, physics, chemistry and engineering.