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**O’Leary, Dianne P.**

**Scientific computing with case studies.**

Philadelphia, PA: Society for Industrial and Applied Mathematics (SIAM) (ISBN 978-0-898716-66-5/pbk). xvi, 383 p. (2009).

Mathematical models and their computed solutions are in the center of scientific computing. Thus, knowledge about numerical solution methods, mathematical software, and the architecture of modern computers is important for a computational scientist. This book provides the material for students specializing in this field. The content is advanced in the sense that some basic knowledge in the area of scientific computing or numerical analysis is required. The topics covered include numerical methods such as dense matrix computations, optimization and data fitting, Monte Carlo computations, ordinary differential equations, non-linear equations as well as sparse matrix computations with applications to partial differential equations. For the presentation, the author has taken the approach to view mathematical methods as a toolbox. Thus, the mathematical models and numerical methods are not treated in detail. Instead, the numerical methods are presented in the form of algorithms and the work with mathematical software is emphasized. Matlab is mainly used, especially for basic numerical algorithms or graphics interfaces. A strength of the book is a large set of case studies, which are presented along with their numerical algorithms. The gap between mathematical software and their actual running program on modern computers is captured by chapters about computer memory and arithmetic as well as error and sensitivity analysis. The book is intended for courses in computer science, but can also be used for self-studies. *Gudula Rünger (Chemnitz)*

*Classification:* N15 N35 N45 N65

*Keywords:* scientific computing; numerical algorithms; error analysis; linear algebra; optimization; nonlinear equations; differential equations; data fitting; Monte Carlo computations; sparse matrix computations