

# Analyse numérique

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practical applications. It provides essential reading for final-year undergraduates, Masters-degree and graduate students, statisticians, and other interdisciplinary researchers wishing to develop good-quality conclusions from their data and to pursue the notion of scientific truth.

Clive LOADER. — **Local regression and likelihood.** — Statistics and computing. — Un vol. relié, 16,5 × 24, de XIII, 290 p. — ISBN 0-387-98775-4. — Prix: DM 129.00. — Springer, New York, 1999.

This book provides an overview of the theory, methods, and application of local regression and likelihood. The first five chapters introduce the problems, first in the local regression setting, followed by extensions to likelihood-based regression models and density estimation. The remaining chapters cover a range of advanced topics and applications, including robust smoothing, survival analysis, classification, and model selection issues. The book emphasizes local regression as a generalization of standard least squares and likelihood methods. The most important tools used in the analysis of local regression are direct generalizations of those used in parametric analysis. Throughout, the book emphasizes understanding of methods, and in particular, what they do, and do not, imply.

John O. RAWLINGS, Sastry G. PANTULA, David A. DICKEY. — **Applied regression analysis: a research tool.** — Second edition. — Springer texts in statistics. — Un vol. relié, 19 × 24,5, de XVIII, 657 p. — ISBN 0-387-98454-2. — Prix: DM 168.00. — Springer, New York, 1998.

The book emphasizes the concepts and the analysis of data sets. It provides a review of the key concepts in simple linear regression, matrix operations, and multiple regression. Methods and criteria for selecting regression variables and geometric interpretations, as well as polynomial, trigonometric, analysis of variance, nonlinear, time series, logistic, random effects, and mixed effects models, are discussed. Several chapters are dedicated to problem areas in regression: Collinearity, non-normality, influential points, correlated errors, and heteroscedastic errors. Appropriate remedies, such as transformations and biased regression, are also covered. Detailed case studies and exercises based on real data sets are used to reinforce the concepts. The data sets used in the book are available on the Internet.

Lothar SACHS. — **Angewandte Statistik: Anwendung statistischer Methoden.** — Neunte, überarbeitete Aufl. — Un vol. broché, 16,5 × 24,5, de XXXIV, 881 p. — ISBN 3-540-65371-6. — Prix: DM 98.00. — Springer, Berlin, 1999.

Neben zahlreichen Hinweisen und Empfehlungen zur Planung und Auswertung von Studien, einer anschaulich und anwenderbezogenen Darstellung von Konzepten, Begriffen, Beziehungen, Fehlerquellen und Fallstricken, dienen Tips und Querverweise sowie ein sehr ausführliches und strukturiertes Sachverzeichnis mit einer Fülle erläuterter Stichworte auch zur Ergänzung von Statistik-Software-Handbüchern, insbesondere für Mediziner, Ingenieure und Naturwissenschaftler. Weiterführende Studien ermöglicht ein ausführliches Literaturverzeichnis.

## *Analyse numérique*

Thierry DUBOIS, François JAUBERTEAU, Roger TEMAM. — **Dynamic multilevel methods and the numerical simulation of turbulence.** — Un vol. relié, 16,5 × 24, de XIX, 289 p. — ISBN 0-521-62165-8. — Prix: £37.50. — Cambridge University Press, Cambridge, 1999.

This book describes the implementation of multilevel methods in a dynamical context, with application to the numerical simulation of turbulent flows. The general ideas for the algorithms presented stem from dynamical systems theory and are based on the decomposition of the

unknown function into two or more arrays corresponding to different scales in the Fourier space. Before describing in detail the numerical algorithm, survey chapters, on the mathematical theory of the Navier-Stokes equations and on the physics of the conventional theory of turbulence, are included. The multilevel methods are applied here to the simulation of homogeneous isotropic turbulent flows as well as turbulent channel flows. The implementation issues are discussed in detail, and numerical simulations of the flows cited above are presented and analyzed.

Michael FEY, Rolf JELTSCH, (Editors). — **Hyperbolic problems: theory, numerics, applications.** — Seventh International Conference in Zürich, February 1998. — Deux vol. reliés,  $17,5 \times 24$ , de XII, 1011 p. au total. — ISBN 3-7643-6123-9 (pour l'ensemble des deux vol.). — Prix: SFr. 328.00 (pour l'ensemble des deux vol.). — Birkhäuser, Basel, 1999.

These proceedings contain, in two volumes, approximately one hundred papers presented at the conference on hyperbolic problems, which has focused to a large extent on the laws of non-linear hyperbolic conservation. Two-fifths of the papers are devoted to mathematical aspects such as global existence, uniqueness, asymptotic behavior such as large time stability, stability and instabilities of waves and structures, various limits of the solution, the Riemann problem and so on. Roughly the same number of articles are devoted to numerical analysis, for example stability and convergence of numerical schemes, as well as schemes with special desired properties such as shock capturing, interface fitting and high-order approximations to multidimensional systems. The results in these contributions, both theoretical and numerical, encompass a wide range of applications such as nonlinear waves in solids, various computational fluid dynamics from small-scale combustion to relativistic astrophysical problems, multiphase phenomena and geometrical optics.

W. GAUTSCHI, G.H. GOLUB, G. OPFER, (Editors). — **Applications and computation of orthogonal polynomials.** — Conference at the Mathematical Research Institute Oberwolfach, Germany, March 22-28, 1998. — International series of numerical mathematics, vol. 131. — Un vol. relié,  $17,5 \times 24$ , de XII, 268 p. — ISBN 3-7643-6137-9. — Prix: SFr. 148.00. — Birkhäuser, Basel, 1999.

This volume contains a collection of papers dealing with applications of orthogonal polynomials and methods for their computation. The applications address problems in applied mathematics as well as problems in engineering and the sciences. Prominent among the former are least-squares approximations, Gauss and related quadrature, iterative methods in linear algebra, the detection of singularities, and integral equations. Applications of the latter kind include the use of wavelets in medical diagnostics and the relevance of orthogonal polynomials in optimal control, dynamical systems, and gas dynamics. Computational methods relate to numerical and symbolic computation and include, in particular, matrix interpretation and convergence, perturbation, and stability analyses of relevant algorithms. Generalizations of orthogonal polynomials are also considered, for example,  $s$ -orthogonal, matrix- and tensor valued, Müntz-type, and complex orthogonal polynomials.

A. ISERLES, (Editor). — **Acta numerica, vol. 8, 1999.** — Un vol. relié,  $18 \times 25,5$ , de 295 p. — ISBN 0-521-77088-2. — Prix: £42.00. — Cambridge University Press, Cambridge, 1999.

*Contents:* Gregory B. Cook and Saul A. Teukolsky: Numerical relativity: challenges for computational science. — Thomas Hagstrom: Radiation boundary conditions for the numerical simulation of waves. — Frank Natterer: Numerical methods in tomography. — Allan Pinkus: Approximation theory of the MLP model in neural networks. — Eckhard Platen: An introduction to numerical methods for stochastic differential equations. — Lloyd N. Trefethen: Computation of pseudospectra.

Prem K. KYTHE. — **Computational conformal mapping.** — Un vol. relié, 16,5×24, de XIV, 462 p. — ISBN 0-8176-3996-9. — Prix: SFr. 128.00. — Birkhäuser, Boston, 1998.

This book provides a self-contained and systematic introduction to the theory and computation of conformal mappings of simply- or multiply- connected regions onto the unit disk or canonical regions. It provides a comprehensive and systematic coverage of the concepts and related numerical analysis with applications to different areas in applied math, physics and engineering. The style and presentation are readily accessible to graduates and researchers.

Alfio QUARTERONI, Alberto VALLI. — **Domain decomposition methods for partial differential equations.** — Numerical mathematics and scientific computation. — Un vol. relié, 16×24, de xv, 360 p. — ISBN 0-19-850178-1. — Prix: £55.00. — Clarendon Press, Oxford, 1999.

Domain decomposition methods are designed to allow the effective numerical solution of partial differential equations on parallel computer architectures. They comprise a relatively new field of study, but have already found applications in many branches of physics and engineering. In this book the authors illustrate the basic mathematical concepts behind domain decomposition, looking at a large variety of boundary value problems. Contents include: symmetric elliptic equations; advection-diffusion equations; the elasticity problem; the Stokes problem for incompressible and compressible fluids; the time-harmonic Maxwell equations; parabolic and hyperbolic equations; and suitable couplings of heterogeneous equations.

J.A. SETHIAN. — **Level set methods and fast marching methods: evolving interfaces in computational geometry, fluid mechanics, computer vision, and material science.** — Cambridge monographs on applied and computational mathematics, vol. 3. — Un vol. broché, 15×23, de xx, 378 p. — ISBN 0-521-64557-3. — Prix: £18.95. — Cambridge University Press, Cambridge, 1999.

The book begins with an introduction to the dynamics of moving curves and surfaces. Next, efficient computational techniques for approximating viscosity solutions to partial differential equations are developed, using the numerical technology from hyperbolic conservation laws. A large collection of applications are given, including examples from physics, chemistry, fluid mechanics, combustion, image processing, material science, fabrication of microelectronic components, computer vision, computer-aided design, and optimal control theory.

## ***Informatique***

Michael TROTT. — **Graphica 1: The imaginary made real: the art of Michael Trott.** — Un vol. relié, 26×26, de XIII, 89 p. — ISBN 1-57955-009-6. — Prix: US\$34.95. — Wolfram Media, Champaign, IL, 1999.

Two worlds merge in this volume of breathtaking *Mathematica*-generated images. With an artist's eye and a mathematician's tools, Michael Trott has produced a collection of dazzling, surprising images, ranging from the playful to the enthralling. He uses a palette of new tools and techniques to create a mesmerizing new kind of art form, residing in the strange middle ground between the artificial and the natural. Some images are playful geometric explorations; others are directly inspired by the work of such artists as Escher and Vasarely; still others make use of sophisticated mathematical methods borrowed from sciences such as electrodynamics and solid state physics.