Turbulence is a major problem facing modern societies. It makes airline passengers return to their seats and fasten their seatbelts but it also creates drag on the aircraft that causes it to use more fuel and create more pollution. The same applies to cars, ships and the space shuttle. The mathematical theory of turbulence has been an unsolved problem for 500 years and the development of the statistical theory of the Navier-Stokes equations describes turbulent flow has been an open problem.

Features
► This book presents the first mathematical theory of fully-developed turbulence ► Shows the stochastic Navier-Stokes Equation is the appropriate model and the statistical theory of this equation is developed ► Proves the Kolmogorov-Obukhov statistical theory of turbulence with the correct intermittency corrections ► Probability distribution functions of velocity differences of turbulent fluids are found and compared with simulations and experiments

Contents

Fields of interest
Mathematical Applications in the Physical Sciences; Fluid- and Aerodynamics; Partial Differential Equations

Target groups
Research

Discount group
Professional Non-Medical

B. Duplantier, CEA Saclay, Gif-sur-Yvette, France (Ed)

Time
Poincaré Seminar 2010

This eleventh volume in the Poincaré Seminar Series presents an interdisciplinary perspective on the concept of Time, which poses some of the most challenging questions in science. Five articles, written by the Fields medalist C. Villani, the two outstanding theoretical physicists T. Damour and C. Jarzynski, the leading experimentalist C. Salomon, and the famous philosopher of science H. Price, describe recent developments related to the mathematical, physical, experimental, and philosophical facets of this fascinating concept. These articles are also highly pedagogical, as befits their origin in lectures to a broad scientific audience.

Features
► Presents an interdisciplinary view of the concept of Time ► Contains a contribution of the 2010 Fields medalist Cedric Villani in English and French ► Addressed to both physicists and mathematicians

Contents

Fields of interest
Mathematics, general; Mathematical Physics; Dynamical Systems and Ergodic Theory

Target groups
Research

Discount group
Professional Non-Medical

S. Ervedoza, Institut de Mathématiques de Toulouse, France; E. Zuazua, BCAM – Basque Center for Applied Mathematics, Bilbao, Spain

On the Numerical Approximations of Exact Controls for Waves

This book is devoted to fully developing and comparing the two main approaches to the numerical approximation of controls for wave propagation phenomena: the continuous and the discrete. This is accomplished in the abstract functional setting of conservative semigroups. The main results of the work unify, to a large extent, these two approaches, which yield similar algorithms and convergence rates. The discrete approach, however, gives not only efficient numerical approximations of the continuous controls, but also ensures some partial controllability properties of the finite-dimensional approximated dynamics.

Features
► Devoted to fully developing and comparing continuous and the discrete approaches to the numerical approximation of controls for wave propagation phenomena ► Provides convergence results for the discrete wave equation when discretized using finite differences and proves the convergence of the discrete wave equation with non-homogeneous Dirichlet conditions

Contents

Fields of interest
Approximations and Expansions; Partial Differential Equations; Systems Theory, Control

Target groups
Research

Discount group
Professional Non-Medical
AN INTRODUCTION TO THE REGULARITY THEORY FOR ELLIPTIC SYSTEMS, HARMONIC MAPS AND MINIMAL GRAPHS

M. Giaquinta, Scuola Normale Superiore, Pisa, Italy; L. Martinazzi, Rutgers University, Piscataway, NJ, USA

This volume deals with the regularity theory for elliptic systems. We may find the origin of such a theory in two of the problems posed by David Hilbert in his celebrated lecture delivered during the International Congress of Mathematicians in 1900 in Paris: 19th problem: Are the solutions to regular problems in the Calculus of Variations always necessarily analytic? 20th problem: does any variational problem have a solution, provided that certain assumptions regarding the given boundary conditions are satisfied, and provided that the notion of a solution is suitably extended? During the last century these two problems have generated a great deal of work, usually referred to as regularity theory, which makes this topic quite relevant in many fields and still very active for research. However, the purpose of this volume, addressed mainly to students, is much more limited.

FEATURES

- Covers both classical and recent topics
- Very few prerequisites
- Excellent introduction to the subject

CONTENTS


FIELD OF INTEREST

Partial Differential Equations

TARGET GROUPS

Research

DISCOUNT GROUP

Professional Non-Medical

COMPUTING QUALITATIVELY CORRECT APPROXIMATIONS OF BALANCE LAWS

L. Gosse, CNR, Rome, Italy

EXPERIMENTAL-FIT, WELL-BALANCED AND ASYMPTOTIC-PRESERVING

The focus of this book is to present fundamentals of physically (i.e., well-balanced) and numerically (i.e., asymptotic-preserving) well-posed approximations for general Balance Laws. The aim is to present, as much as possible, both the physical and the numerical points of view in order to make the reader aware of the interplay between them. As such, the book can be seen as a guide rather than a textbook, and it aims to help the reader to develop an expertise in physically well-balanced and asymptotic-preserving approximations rather than teaching specific numerical schemes.

FIELD OF INTEREST

Computational Mathematics and Numerical Analysis; Partial Differential Equations; Applications of Mathematics

TARGET GROUPS

Research

DISCOUNT GROUP

Professional Non-Medical
System Identification Using Regular and Quantized Observations

Applications of Large Deviations Principles

This brief presents characterizations of identification errors under a probabilistic framework when output sensors are binary, quantized, or regular. By considering both space complexity in terms of signal quantization and time complexity with respect to data window sizes, this study provides a new perspective to understand the fundamental relationship between probabilistic errors and resources, which may represent data sizes in computer usage, computational complexity in algorithms, sample sizes in statistical analysis and channel bandwidths in communications.

Features
- Presents characterizations of identification errors under a probabilistic framework when output sensors are binary, quantized, or regular
- First book devoted to large deviations to system identification
- Application oriented

Contents
Introduction and Overview.- System Identification: Formulation.- Large Deviations: An Introduction.- LDP under I.I.D. Noises.- LDP under Mixing Noises.- Applications to Battery Diagnosis.- Applications to Medical Signal Processing.- Applications to Electric Machines.- Remarks and Conclusion.- References.- Index

Fields of interest
- Systems Theory, Control; Control; Probability Theory and Stochastic Processes

Target groups
- Research

Discount group
- Professional Non-Medical

Due January 2013
2013. X, 95 p. 17 illus., 16 in color. (SpringerBriefs in Mathematics) Softcover
- $49.95
ISBN 978-1-4614-6291-0

Due March 2013
2013. VIII, 350 p. (Trends in Mathematics) Hardcover
- approx. $129.00
ISBN 978-3-0348-0602-2

Due December 2012
2013. XX, 175 p. 2 illus. Softcover
- $89.95
Intersections of Random Walks

A central study in Probability Theory is the behavior of fluctuation phenomena of partial sums of different types of random variable. One of the most useful concepts for this purpose is that of the random walk which has applications in many areas, particularly in statistical physics and statistical chemistry. Originally published in 1991, Intersections of Random Walks focuses on and explores a number of problems dealing primarily with the nonintersection of random walks and the self-avoiding walk. Many of these problems arise in studying statistical physics and other critical phenomena. Topics include: discrete harmonic measure, including an introduction to diffusion limited aggregation (DLA); the probability that independent random walks do not intersect; and properties of walks without self-intersections. The present softcover reprint includes corrections and addenda from the 1996 printing, and makes this classic monograph available to a wider audience.

Features

- Affordable reprint of a classic monograph
- Topics covered include: discrete harmonic measure; the probability that independent random walks do not intersect; and properties of walks without self-intersections
- Includes the corrections and addendum from the second printing

Contents


Fields of interest

Probability Theory and Stochastic Processes; Statistical Physics, Dynamical Systems and Complexity; Statistics for Engineering, Physics, Computer Science, Chemistry and Earth Sciences

Target groups

Research

Discount group

Professional Non-Medical
Visual Reasoning with Diagrams

Logic, the discipline that explores valid reasoning, does not need to be limited to a specific form of representation but should include any form as long as it allows us to draw sound conclusions from given information.

Contents

Fields of interest
Mathematical Logic and Foundations; Visualization; Logic

Target groups
Research

Discount group
Professional Non-Medical

Due March 2013
2013. XVI, 212 p. 113 illus., 12 in color. (Studies in Universal Logic) Softcover
► $69.95
ISBN 978-3-0348-0599-5

A. Nagurney, University of Massachusetts Amherst, MA, USA; M. Yu, University of Portland, OR, USA; A. H. Masoumi, University of Massachusetts Amherst, MA, USA; L. S. Nagurney, University of Hartford, CT, USA

Networks Against Time

Supply Chain Analytics for Perishable Products

Despite significant achievements, the discipline of supply chain management is still unable to satisfactorily handle many practical real-world challenges. The authors of Networks Against Time claim that a unified supply chain network analytics framework is needed which should be able to handle optimization and competitive behavior while also maintain relevance to many industrial sectors where perishable products are prominent, from healthcare to food and from fashion apparel to technology. This Brief provides a wide range of critical supply chain problems which are modeled as generalized networks.

Features
► Captures the full scope of supply chain network activities like production, storage, transportation and distribution ▶ Case studies demonstrate the application of models and algorithms to real-world sectors ▶ Graphically depicts network structures of distinct supply chains comparisons across different application domains

Contents

Fields of interest
Operations Research, Management Science; Game Theory, Economics, Social and Behav. Sciences; Mathematical Modeling and Industrial Mathematics

Target groups
Research

Discount group
Professional Non-Medical

Due January 2013
2013. VI, 151 p. 25 illus. (SpringerBriefs in Optimization) Softcover
► $49.95

J. Neukirch, Universität Regensburg, Germany
A. Schmidt, Universität Heidelberg, Germany (Ed)

Class Field Theory

-The Bonn Lectures- Edited by Alexander Schmidt

The present manuscript is an improved edition of a text that first appeared under the same title in Bonner Mathematische Schriften, no.26, and originated from a series of lectures given by the author in 1965/66 in Wolfgang Krull's seminar in Bonn. Its main goal is to provide the reader, acquainted with the basics of algebraic number theory, a quick and immediate access to class field theory. This script consists of three parts, the first of which discusses the cohomology of finite groups. The second part discusses local class field theory, and the third part concerns the class field theory of finite algebraic number fields.

Features
► Clear presentation ▶ Quick and immediate access to the subject ▶ A classic (established and prominent German original)

Contents
Cohomology of Finite Groups.- Local Class Field Theory.- Global Class Field Theory.

Fields of interest
Number Theory; Algebra

Target groups
Upper undergraduate

Discount group
Professional Non-Medical

Due March 2013
2nd ed. 2013. X, 184 p. Softcover
► approx. $69.95
ISBN 978-3-642-35436-6

A. Moktefi, Université de Strasbourg, France; S.-J. Shin, Yale University, New Haven, CT, USA (Eds)
The Sherrington-Kirkpatrick Model

The celebrated Parisi solution of the Sherrington-Kirkpatrick model for spin glasses is one of the most important achievements in the field of disordered systems. Over the last three decades, through the efforts of theoretical physicists and mathematicians, the essential aspects of the Parisi solution were clarified and proved mathematically. The core ideas of the theory that emerged are the subject of this book, including the recent solution of the Parisi ultrametricity conjecture and a conceptually simple proof of the Parisi formula for the free energy. The treatment is self-contained and should be accessible to graduate students with a background in probability theory, with no prior knowledge of spin glasses.

Features

- Presents many central ideas of the mathematical theory of the Sherrington-Kirkpatrick model in detail
- Contains a fundamental breakthrough in this subject by the author
- Accessible to graduate students working in probability theory or statistical mechanics

Contents


Fields of interest

Probability Theory and Stochastic Processes; Mathematical Physics; Mathematical Methods in Physics

Target groups

Research

Discount group

Professional Non-Medical

Global Wellposedness of Nonlinear Evolutionary Fluid Equations

This book is an essay on the epistemology of classifications. Its main purpose is not to provide an exposition of an actual mathematical theory of classifications, that is, a general theory which would be available to any kind of them: hierarchical or non-hierarchical, ordinary or fuzzy, overlapping or non-overlapping, finite or infinite, and so on, establishing a basis for all possible divisions of the real world. For the moment, such a theory remains nothing but a dream. Instead, the authors essentially put forward a number of key questions.

Features

- Takes a comprehensive and historical approach to classification problems
- Is first in making a connection between previously separate domains of classification theory in applied mathematics, computer science and pure mathematics
- Provides an original and progressive introduction to the main questions
- Attempts to present and comment the idea of a general theory of classifications

Contents

Foreword.- 1 Philosophical problems.- 2 Information data structures.- 3 Empirical Clustering and classic hierarchies.- 4 Algebra of trees.- 5 Generalized Classifications.- 6 Topology of generalized classifications.- 7 Meta-classification.- 8 For an axiomatic theory of classifications

Fields of interest

Mathematical Logic and Foundations; Order, Lattices, Ordered Algebraic Structures; Logic

Target groups

Research

Discount group

Professional Non-Medical
L. C. Rogers, University of Cambridge, UK

**Optimal Investment**

Readers of this book will learn how to solve a wide range of optimal investment problems arising in finance and economics. Starting from the fundamental Merton problem, many variants are presented and solved, often using numerical techniques that the book also covers. The final chapter assesses the relevance of many of the models in common use when applied to data.

**Features**
- Presents the main methods for solving stochastic optimal control problems arising in finance
- Through a large number of worked problems, illustrates how to use a combination of analytic and numerical techniques to actually find a solution even when none is available in closed form
- Critiques the usefulness of theory in the light of stylized facts of asset return

**Contents**

**Fields of interest**
Quantitative Finance; Finance/Investment/Banking; Numerical Analysis

**Target groups**
Professional/practitioner

**Discount group**
Professional Non-Medical

Due January 2013

2013. XII, 156 p. 44 illus., 3 in color. (SpringerBriefs in Quantitative Finance) Softcover
- $49.95
ISBN 978-3-642-35201-0

P. Soberón Bravo, University College London, UK

**Problem-solving Methods in Combinatorics**

**An approach to olympiad problems**

Every year there is at least one combinatorics problem in each of the major international mathematical olympiads. These problems can only be solved with a very high level of wit and creativity. This book explains all the problem-solving techniques necessary to tackle these problems, with clear examples from recent contests. It also includes a large problem section for each topic, including hints and full solutions so that the reader can practice the material covered in the book. The material will be useful not only to participants in the olympiads and their coaches but also in university courses on combinatorics.

**Features**
- Explains the tools necessary tools to solve olympiad combinatorics type problems, using clear examples from recent contests
- Includes over 120 problems with hints and full, sometimes multiple, solutions
- May be used by olympiad students and coaches but is also useful for university courses on combinatorics
- Almost completely self-contained, requiring very little technical knowledge

**Contents**
Introduction.- 1 First concepts.- 2 The pigeonhole principle.- 3 Invariants.- 4 Graph theory.- 5 Functions.- 6 Generating Functions.- 7 Partitions.- 8 Hints for the problems.- 9 Solutions to the problems.- Notation.- Further reading.- Index.

**Field of interest**
Combinatorics

**Target groups**
Upper undergraduate

**Discount group**
Professional Non-Medical

Due March 2013

2013. Approx. 220 p. Softcover
- approx. $59.95
ISBN 978-3-0348-0596-4