Geometric Ysis Of Hyperbolic Differential Equations An Introduction London Mathematical Society Lecture Note Series

Physical formulations leading to ill-posed problems Basic concepts of the theory of ill-posed problems Analytic continuation Boundary value problems for differential equations Volterra equations Integral geometry Multidimensional inverse problems for linear differential equations

Constructible and perverse sheaves are the algebraic

counterpart of the decomposition of a singular space into smooth manifolds. This introduction to the subject can be regarded as a textbook on modern algebraic topology, treating the cohomology of spaces with sheaf (as opposed to constant) coefficients. The author helps readers progress quickly from the basic theory to current research questions, thoroughly supported along the way by examples and exercises.

This book introduces graduate students and researchers in mathematics and the sciences to the multifaceted subject of the equations of hyperbolic type, which are used, in particular, to describe propagation of waves at finite speed.

Among the topics carefully presented in the book are nonlinear geometric optics, the asymptotic analysis of short wavelength solutions, and nonlinear interaction of such waves. Studied in detail are the damping of waves, resonance, dispersive decay, and solutions to the compressible Euler equations with dense oscillations created by resonant interactions. Many fundamental results are presented for the first time in a textbook format. In addition to dense oscillations, these include the treatment of precise speed of propagation and the existence and stability questions for the three wave interaction equations. One of the strengths of this book is its careful motivation of ideas

and proofs, showing how they evolve from related, simpler cases. This makes the book quite useful to both researchers and graduate students interested in hyperbolic partial differential equations. Numerous exercises encourage active participation of the reader. The author is a professor of mathematics at the University of Michigan. A recognized expert in partial differential equations, he has made important contributions to the transformation of three areas of hyperbolic partial differential equations: nonlinear microlocal analysis, the control of waves, and nonlinear geometric optics.

From Frenet to Cartan: The Method of Moving Frames

Government Reports Announcements
A Geometric Approach to Modeling and Analysis
Proceedings of the 40th Taniguchi Symposium
Tools for Computational Finance
Analysis and Geometry in Several Complex Variables

Provides the reader with a deep appreciation of complex analysis and how this subject fits into mathematics. The first four chapters provide an introduction to complex analysis with many elementary and unusual applications. Chapters 5 to 7 develop the Cauchy theory and include some striking applications to calculus. Chapter 8 glimpses

several appealing topics, simultaneously unifying the book and opening the door to further study.
Despite decades of research and progress in the theory of generalized solutions to first-order nonlinear partial differential equations, a gap between the local and the global theories remains: The Cauchy characteristic method yields the local theory of classical solutions. Historically, the global theory has principally depended on the vanishing viscosity method. The authors of this volume help bridge the gap between the local and global theories by using the

characteristic method as a basis for setting a theoretical framework for the study of global generalized solutions. That is, they extend the smooth solutions obtained by the characteristic method. The authors offer material previously unpublished in book form, including treatments of the life span of classical solutions, the construction of singularities of generalized solutions, new existence and uniqueness theorems on minimax solutions, differential inequalities of Haar type and their application to the uniqueness of global, semi-classical solutions, and Hopf-type explicit formulas for global solutions.

These subjects yield interesting relations between purely mathematical theory and the applications of first-order nonlinear PDEs. The Characteristic Method and Its Generalizations for First-Order Nonlinear Partial Differential Equations represents a comprehensive exposition of the authors' works over the last decade. The book is self-contained and assumes only basic measure theory, topology, and ordinary differential equations as prerequisites. With its innovative approach, new results, and many applications, it will prove valuable to mathematicians, physicists, and engineers and

especially interesting to researchers in nonlinear PDEs, differential inequalities, multivalued analysis, differential games, and related topics in applied analysis.
This edition contains more material. The largest addition is a new section on jump processes (Section 1.9). The derivation of a related partial integro differential equation is included in Appendix A3. More material is devoted to Monte Carlo simulation. An algorithm for the standard workhorse of in verting the normal distribution is added to Appendix A7. New figures and more exercises are intended to improve the clarity at some

places. Several further references give hints on more advanced material and on important developments. Many small changes are hoped to improve the readability of this book. Further I have made an effort to correct misprints and errors that I knew about. A new domain is being prepared to serve the needs of the computational finance community, and to provide complementary material to this book. The address of the domain is www.compfin.de The domain is under construction; it replaces the website address www . mi. uni koeln.de/numerik/compfin/. Suggestions and remarks both on this book and on the domain

are most welcome.

Hyperbolic Partial Differential Equations and Geometric Optics

p-adic Numbers

Block Error-Correcting Codes

Lectures at a Summer School in Nordfjordeid, Norway, June 2001

Lectures given at the EMS Summer School and Conference held in Edinburgh, Scotland 2000

Lectures on Hyperbolic Geometry

A twenty-one volume encyclopedia with 32,000 entries and more than 16,000 illustrations.

Functions in R and C, including the theory of Fourier series,

Fourier integrals and part of that of holomorphic functions, form the focal topic of these two volumes. Based on a course given by the author to large audiences at Paris VII University for many years, the exposition proceeds somewhat nonlinearly, blending rigorous mathematics skilfully with didactical and historical considerations. It sets out to illustrate the variety of possible approaches to the main results, in order to initiate the reader to methods, the underlying reasoning, and fundamental ideas. It is suitable for both teaching and self-study. In his familiar, personal style, the author emphasizes ideas over calculations and, avoiding the condensed style frequently found in textbooks, explains these ideas without parsimony of words. The French edition in four volumes, published from

1998, has met with resounding success: the first two volumes are now available in English.

Using various examples this monograph shows that algebra is one of the most beautiful forms of mathematics. In doing so, it explains the basics of algebra, number theory, set theory and probability. The text presupposes very limited knowledge of mathematics, making it an ideal read for anybody new to the subject. The author, I.R. Shafarevich, is well-known across the world as one of the most outstanding mathematicians of this century as well as one of the most respected mathematical writers.

An Introduction to Complex Analysis and Geometry

A First Practical Course

NASA SP.
Mathematical Reviews
A Computational Primer
Library of Congress Subject Headings

This monograph is based on the author's results on the Riemannian ge ometry of foliations with nonnegative mixed curvature and on the geometry of sub manifolds with generators (rulings) in a Riemannian space of nonnegative curvature. The main idea is that such foliated (sub) manifolds can be decom posed when the dimension of the leaves (generators) is large. The methods of investigation are mostly synthetic. The work is divided into two parts, consisting of seven

chapters and three appendices. Appendix A was written jointly with V. Toponogov. Part 1 is devoted to the Riemannian geometry of foliations. In the first few sections of Chapter I we give a survey of the basic results on foliated smooth manifolds (Sections 1.1-1.3), and finish in Section 1.4 with a discussion of the key problem of this work: the role of Riemannian curvature in the study of foliations on manifolds and submanifolds. This is a very basic and accessible introduction to option pricing, invoking a minimum of stochastic analysis and requiring only basic mathematical skills. It covers the theory essential to the statistical modeling of stocks, pricing of derivatives with martingale theory, and computational finance including both finite-

difference and Monte Carlo methods.
The method of moving frames originated in the early nineteenth century with the notion of the Frenet frame along a curve in Euclidean space. Later, Darboux expanded this idea to the study of surfaces. The method was brought to its full power in the early twentieth century by Elie Cartan, and its development continues today with the work of Fels, Olver, and others. This book is an introduction to the method of moving frames as developed by Cartan, at a level suitable for beginning graduate students familiar with the geometry of curves and surfaces in Euclidean space. The main focus is on the use of this method to compute local geometric invariants for curves and

surfaces in various 3-dimensional homogeneous spaces, including Euclidean, Minkowski, equi-affine, and projective spaces. Later chapters include applications to several classical problems in differential geometry, as well as an introduction to the nonhomogeneous case via moving frames on Riemannian manifolds. The book is written in a reader-friendly style, building on already familiar concepts from curves and surfaces in Euclidean space. A special feature of this book is the inclusion of detailed guidance regarding the use of the computer algebra system Maple™ to perform many of the computations involved in the exercises.

Index

Analysis I

Discourses on Algebra
Numerical Optimization
Option Theory with Stochastic Analysis
Viscous Profiles and Numerical Methods for Shock Waves

There are numbers of all kinds: rational, real, complex, p-adic. The p-adic numbers are less well known than the others, but they play a fundamental role in number theory and in other parts of mathematics. This elementary introduction offers a broad understanding of p-adic numbers. From the reviews: "It is perhaps the most suitable text for beginners, and I shall definitely recommend it to anyone who asks me what a p-adic number is." --THE MATHEMATICAL GAZETTE

This volume consists of a collection of articles for the

proceedings of the 40th Taniguchi Symposium Analysis and Geometry in Several Complex Variables held in Katata, Japan, on June 23-28, 1997. Since the inhomogeneous Cauchy-Riemann equation was introduced in the study of Complex Analysis of Several Variables, there has been strong interaction between Complex Analysis and Real Analysis, in particular, the theory of Partial Differential Equations. Problems in Complex Anal ysis stimulate the development of the PDE theory which subsequently can be applied to Complex Analysis. This interaction involves Differen tial Geometry, for instance, via the CR structure modeled on the induced structure on the boundary of a complex manifold. Such structures are naturally related to the PDE theory. Differential Geometric formalisms are efficiently

used in settling problems in Complex Analysis and the results enrich the theory of Differential Geometry. This volume focuses on the most recent developments in this inter action, including links with other fields such as Algebraic Geometry and Theoretical Physics. Written by participants in the Symposium, this vol ume treats various aspects of CR geometry and the Bergman kernel/ pro jection, together with other major subjects in modern Complex Analysis. We hope that this volume will serve as a resource for all who are interested in the new trends in this area. We would like to express our gratitude to the Taniguchi Foundation for generous financial support and hospitality. We would also like to thank Professor Kiyosi Ito who coordinated the organization of the symposium.

This book presents the most recent advances in complex Finsler geometry and related geometries: the geometry of complex Lagrange, Hamilton and Cartan Spaces. The last three spaces were initially introduced to and have been investigated by the author of the present volume over the past several years. This book will acquaint the reader with: - a survey of some basic results from complex manifolds and the complex vector bundles theory, - the geometry of holomorphic tangent bundles, - an analysis of the main results in complex Finsler geometry, - a study of the geometry of complex Lagrange and generalized Lagrange Spaces. Of special interest are their holomorphic subspaces, - the construction of the complex Hamilton geometry, - the complex Finsler vector bundles. Audience: Geometers, complex analysts, and

physicists in quantum field theory and in theoretical mechanics will find this book of interest. The volume can be also used as a supplementary graduate text.

Subject Headings Used in the Dictionary Catalogs of the Library of Congress [from 1897 Through December 1955]

Bulletin

Ill-posed Problems of Mathematical Physics and Analysis

New Analytic and Geometric Methods in Inverse Problems

Calabi-Yau Manifolds and Related Geometries

This book provides an easily accessible, computationally-oriented introduction into the numerical solution of stochastic differential equations

using computer experiments. It develops in the reader an ability to apply numerical methods solving stochastic differential equations. It also creates an intuitive understanding of the necessary theoretical background. Software containing programs for over 100 problems is available online.

Error-correcting codes have been incorporated in numerous working communication and memory systems. This book covers the mathematical aspects of the theory of block error-correcting codes together, in mutual reinforcement, with computational discussions, implementations and

examples of all relevant concepts, functions and algorithms. This combined approach facilitates the reading and understanding of the subject. The digital companion of the book is a non-printable .pdf document with hyperlinks. The examples included in the book can be run with just a mouse click and modified and saved by users for their own purpose. In inverse problems, the aim is to obtain, via a mathematical model, information on quantities that are not directly observable but rather depend on other observable quantities. Inverse problems are encountered in such diverse areas of application as

medical imaging, remote sensing, material testing, geosciences and financing. It has become evident that new ideas coming from differential geometry and modern analysis are needed to tackle even some of the most classical inverse problems. This book contains a collection of presentations, written by leading specialists, aiming to give the reader up-to-date tools for understanding the current developments in the field.

The Characteristic Method and Its Generalizations for First-Order Nonlinear Partial Differential Equations

Numerical Solution of SDE Through Computer Experiments

Catalogue Number

University of Michigan Official Publication

Geometric Theory of Generalized Functions with Applications to General Relativity

Bibliography of Scientific Publications of South & South East Asia

This book contains lecture notes of minicourses at the Regional Geometry Institute at Park City, Utah, in July 1992. Presented here are surveys of breaking developments in a number of areas of nonlinear partial differential equations in

differential geometry. The authors of the articles are not only excellent expositors, but are also leaders in this field of research. All of the articles provide in-depth treatment of the topics and require few prerequisites and less background than current research articles.

This book looks at the mathematical foundations of the models currently in use. All existing books on bioinformatics are software-orientated and they concentrate on computer implementations of mathematical models of biology. This book is unique in the sense that it looks at the mathematical foundations of the models, which are crucial for correct interpretation of the outputs of the models.

This book provides an accessible introduction to the variational formulation of Lagrangian and Hamiltonian

mechanics, with a novel emphasis on global descriptions of the dynamics, which is a significant conceptual departure from more traditional approaches based on the use of local coordinates on the configuration manifold. In particular, we introduce a general methodology for obtaining globally valid equations of motion on configuration manifolds that are Lie groups, homogeneous spaces, and embedded manifolds, thereby avoiding the difficulties associated with coordinate singularities. The material is presented in an approachable fashion by considering concrete configuration manifolds of increasing complexity, which then motivates and naturally leads to the more general formulation that follows. Understanding of the material is enhanced by numerous in-depth examples throughout the book, culminating in non-

trivial applications involving multi-body systems. This book is written for a general audience of mathematicians, engineers, and physicists with a basic knowledge of mechanics. Some basic background in differential geometry is helpful, but not essential, as the relevant concepts are introduced in the book, thereby making the material accessible to a broad audience, and suitable for either self-study or as the basis for a graduate course in applied mathematics, engineering, or physics.

Announcements for the Year ...

Nonlinear partial differential equations in differential geometry

Scientific and Technical Aerospace Reports

Sheaves in Topology

Complex Spaces in Finsler, Lagrange and Hamilton

Geometries
Global Formulations of Lagrangian and Hamiltonian Dynamics on Manifolds
Focussing on the geometry of hyperbolic manifolds, the aim here is to provide an exposition of some fundamental results, while being as self-contained, complete, detailed and unified as possible. Following some classical material on the hyperbolic space and the Teichmüller space, the book centers on the two fundamental results: Mostow's rigidity theorem (including a complete proof, following Gromov and Thurston) and Margulis' lemma. These then form the basis for studying Chabauty and geometric topology; a unified exposition is

given of Wang's theorem and the Jorgensen-Thurston theory; and much space is devoted to the 3D case: a complete and elementary proof of the hyperbolic surgery theorem, based on the representation of three manifolds as glued ideal tetrahedra.

This is an introduction to a very active field of research, on the boundary between mathematics and physics. It is aimed at graduate students and researchers in geometry and string theory. Proofs or sketches are given for many important results. From the reviews: "An excellent introduction to current research in the geometry of Calabi-Yau manifolds, hyper-Kähler manifolds, exceptional holonomy and mirror symmetry....This is an excellent

and useful book." --MATHEMATICAL REVIEWS
For readers with some competence in PDE solution properties, this book offers an interdisciplinary approach to problems occurring in natural environmental media: the hydrosphere, atmosphere, cryosphere, lithosphere, biosphere and ionosphere. It presents two major discretization methods: Finite Difference and Finite Element, plus a section on practical approaches to ill-posed problems. The blend of theory, analysis, and implementation practicality supports solving and understanding complicated problems.
An Introduction to Mathematical Finance
Grants and Awards for the Fiscal Year Ended ...

theoretical and practical aspects : with 26 figures
An Introduction
Catalog of the University of Iowa
Academic American Encyclopedia
This book starts with illustrations of the ubiquitous character of optimization, and describes numerical algorithms in a tutorial way. It covers fundamental algorithms as well as more specialized and advanced topics for unconstrained and constrained problems. This new edition contains computational exercises in the form of case studies which help understanding optimization methods beyond their theoretical description when coming to actual implementation.

This work provides the first comprehensive introduction to the nonlinear theory of generalized functions (in the sense of Colombeau's construction) on differentiable manifolds. Particular emphasis is laid on a diffeomorphism invariant geometric approach to embedding the space of Schwartz distributions into algebras of generalized functions. The foundations of a `nonlinear distributional geometry' are developed, supplying a solid base for an increasing number of applications of algebras of generalized functions to questions of a primarily geometric mature, in particular in mathematical physics. Applications of the resulting theory to symmetry group analysis of differential

equations and the theory of general relativity are presented in separate chapters. These features distinguish the present volume from earlier introductory texts and monographs on the subject. Audience: The book will be of interest to graduate students as well as to researchers in functional analysis, partial differential equations, differential geometry, and mathematical physics.

One strongly represented theme is the power of ideas from dynamical systems that are being adapted and developed in the context of shock waves.

Foliations on Riemannian Manifolds and Submanifolds

Introduction to Mathematical Methods in Bioinformatics

Numerical Partial Differential Equations for Environmental Scientists and Engineers