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FITZPATRICK ALEAH

Optimization Algorithms on Matrix Manifolds American Mathematical Society
This book records my efforts over the past four years to capture in words a description of the form and function of Mathematics, as a background for the Philosophy of Mathematics. My efforts have been encouraged by lec tures that I have given at Heidelberg under the auspices of the Alexander von Humboldt Stiftung, at the University of Chicago, and at the University of Minnesota, the latter under the auspices of the Institute for Mathematics and Its Applications. Jean Benabou has carefully read the entire manuscript and has offered incisive comments. George Glauberman, Car los Kenig, Christopher Mulvey, R. Narasimhan, and Dieter Puppe have provided similar comments on chosen chapters. Fred Linton has pointed out places requiring a more exact choice of wording. Many conversations with George Mackey have given me important insights on the nature of Mathematics. I have had similar help from Alfred Aeppli, John Gray, Jay Goldman, Peter Johnstone, Bill Lawvere, and Roger Lyndon. Over the years, I have profited from discussions of general issues with my colleagues Felix Browder and Melvin Rothenberg. Ideas from Tammo Tom Dieck, Albrecht Dold, Richard Lashof, and Ib Madsen have assisted in my study of geometry. Jerry Bona and B.L. Foster have helped with my examina tion of mechanics. My observations about logic have been subject to con structive scrutiny by Gert Miiller, Marian Boykan Pour-El, Ted Slaman, R. Voreadou, Volker Weispfennig, and Hugh Woodin.
The tangent space at a special sympletic instanton bundle on P_1tn2_1tnn_1tn+_1tn1 Princeton University Press
For graduate students and research mathematicians interested in global analysis and the analysis of manifolds, lays the foundations for a differential calculus in infinite dimensions and discusses applications in infinite-dimension differential geometry and global analysis not involving Sobolev completions and fixed-point theory. Shows how the notion of smoothness as mapping smooth curves to smooth curves coincides with all known reasonable concepts up to Frechet spaces. Then develops a calculus of holomorphic mappings, and another of real analytical mapping. Emphasizes regular infinite dimensional Lie groups. Annotation copyrighted by Book News, Inc., Portland, OR
A Course in Differential Geometry Springer Science & Business Media
"Geometric Structure of High-Dimensional Data and Dimensionality Reduction" adopts data geometry as a framework to address various methods of dimensionality reduction. In addition to the introduction to well-known linear methods, the book moreover stresses the recently developed nonlinear methods and introduces the applications of dimensionality reduction in many areas, such as face recognition, image segmentation, data classification, data visualization, and hyperspectral imagery data analysis. Numerous tables and graphs are included to illustrate the ideas, effects, and shortcomings of the methods. MATLAB code of all dimensionality reduction algorithms is provided to aid the readers with the implementations on computers. The book will be useful for mathematicians, statisticians, computer scientists, and data analysts. It is also a valuable handbook for other practitioners who have a basic background in mathematics, statistics and/or computer algorithms, like internet search engine designers, physicists, geologists, electronic engineers, and economists. Jianzhong Wang is a Professor of Mathematics at Sam Houston State University, U.S.A.
Modern Differential Geometry for Physicists American Mathematical Soc.
"The book is devoted to geometry of algebraic varieties in projective spaces. Among the objects considered in some detail are tangent and secant varieties, Gauss maps, dual varieties, hyperplane sections, projections, and varieties of small codimension. Emphasis is made on the study of interplay between irregular behavior of (higher) secant varieties and irregular tangencies to the original variety. Classification of varieties with unusual tangential properties yields interesting examples many of which arise as orbits of representations of algebraic groups."--ABSTRACT.
A Geometric Approach to Differential Forms American Mathematical Soc.
This text presents a graduate-level introduction to differential geometry for mathematics and physics students. The exposition follows the historical development of the concepts of connection and curvature with the goal of explaining the Chern–Weil theory of characteristic classes on a principal bundle. Along the way we encounter some of the high points in the history of differential geometry, for example, Gauss' Theorema Egregium and the Gauss–Bonnet theorem. Exercises throughout the book test the reader’s understanding of the material and sometimes illustrate extensions of the theory. Initially, the prerequisites for the reader include a passing familiarity with manifolds. After the first chapter, it becomes necessary to understand and manipulate differential forms. A knowledge of de Rham cohomology is required for the last third of the text. Prerequisite material is contained in author's text An Introduction to Manifolds, and can be learned in one semester. For the benefit of the reader and to establish common notations, Appendix A recalls the basics of manifold theory. Additionally, in an attempt to make the exposition more self-contained, sections on algebraic constructions such as the tensor product and the exterior power are included. Differential geometry, as its name implies, is the study of geometry using differential calculus. It dates back to Newton and Leibniz in the seventeenth century, but it was not until the nineteenth century, with the work of Gauss on surfaces and Riemann on the curvature tensor, that differential geometry

flourished and its modern foundation was laid. Over the past one hundred years, differential geometry has proven indispensable to an understanding of the physical world, in Einstein's general theory of relativity, in the theory of gravitation, in gauge theory, and now in string theory. Differential geometry is also useful in topology, several complex variables, algebraic geometry, complex manifolds, and dynamical systems, among other fields. The field has even found applications to group theory as in Gromov's work and to probability theory as in Diaconis's work. It is not too far-fetched to argue that differential geometry should be in every mathematician's arsenal.

The Tangent Space at a Special Symplectic Instanton Bundle on P 2n+1 Springer Science & Business Media

This unique book complements traditional textbooks by providing a visual yet rigorous survey of the mathematics used in theoretical physics beyond that typically covered in undergraduate math and physics courses. The exposition is pedagogical but compact, and the emphasis is on defining and visualizing concepts and relationships between them, as well as listing common confusions, alternative notations and jargon, and relevant facts and theorems. Special attention is given to detailed figures and geometric viewpoints. Certain topics which are well covered in textbooks, such as historical motivations, proofs and derivations, and tools for practical calculations, are avoided. The primary physical models targeted are general relativity, spinors, and gauge theories, with notable chapters on Riemannian geometry, Clifford algebras, and fiber bundles.

Differential Topology Birkhäuser

Author has written several excellent Springer books.; This book is a sequel to Introduction to Topological Manifolds; Careful and illuminating explanations, excellent diagrams and exemplary motivation; Includes short preliminary sections before each section explaining what is ahead and why

Algebraic Geometry Springer Science & Business Media

This book offers an introduction to the theory of differentiable manifolds and fiber bundles. It examines bundles from the point of view of metric differential geometry: Euclidean bundles, Riemannian connections, curvature, and Chern-Weil theory are discussed, including the Pontrjagin, Euler, and Chern characteristic classes of a vector bundle. These concepts are illustrated in detail for bundles over spheres.

Mathematics For Physics: An Illustrated Handbook Princeton University Press

Manifolds, the higher-dimensional analogs of smooth curves and surfaces, are fundamental objects in modern mathematics. Combining aspects of algebra, topology, and analysis, manifolds have also been applied to classical mechanics, general relativity, and quantum field theory. In this streamlined introduction to the subject, the theory of manifolds is presented with the aim of helping the reader achieve a rapid mastery of the essential topics. By the end of the book the reader should be able to compute, at least for simple spaces, one of the most basic topological invariants of a manifold, its de Rham cohomology. Along the way, the reader acquires the knowledge and skills necessary for further study of geometry and topology. The requisite point-set topology is included in an appendix of twenty pages; other appendices review facts from real analysis and linear algebra. Hints and solutions are provided to many of the exercises and problems. This work may be used as the text for a one-semester graduate or advanced undergraduate course, as well as by students engaged in self-study. Requiring only minimal undergraduate prerequisites, 'Introduction to Manifolds' is also an excellent foundation for Springer's GTM 82, 'Differential Forms in Algebraic Topology'.

Manifolds and Differential Geometry Springer Science & Business Media

This book presents many of the main developments of the past two decades in the study of real submanifolds in complex space, providing crucial background material for researchers and advanced graduate students. The techniques in this area borrow from real and complex analysis and partial differential equations, as well as from differential, algebraic, and analytical geometry. In turn, these latter areas have been enriched over the years by the study of problems in several complex variables addressed here. The authors, M. Salah Baouendi, Peter Ebenfelt, and Linda Preiss Rothschild, include extensive preliminary material to make the book accessible to nonspecialists. One of the most important topics that the authors address here is the holomorphic extension of functions and mappings that satisfy the tangential Cauchy-Riemann equations on real submanifolds. They present the main results in this area with a novel and self-contained approach. The book also devotes considerable attention to the study of holomorphic mappings between real submanifolds, and proves finite determination of such mappings by their jets under some optimal assumptions. The authors also give a thorough comparison of the various nondegeneracy conditions for manifolds and mappings and present new geometric interpretations of these conditions. Throughout the book, Cauchy-Riemann vector fields and their orbits play a central role and are presented in a setting that is both general and elementary.

From Calculus to Cohomology Princeton University Press

Written by Arthur Ogus on the basis of notes from Pierre Berthelot's seminar on crystalline cohomology at Princeton University in the spring of 1974, this book constitutes an informal introduction to a significant branch of algebraic geometry. Specifically, it provides the basic tools used in the study of crystalline cohomology of algebraic varieties in positive characteristic. Originally published in 1978. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

An Introduction to Manifolds Allied Publishers

Information geometry provides the mathematical sciences with a fresh framework of analysis. This book presents a comprehensive introduction to the mathematical foundation of information geometry. It provides an overview of many areas of applications, such as statistics, linear systems, information theory, quantum mechanics, and convex analysis.

Differential Geometry Springer Science & Business Media

This textbook for second-year graduate students is intended as an introduction to differential geometry with principal emphasis on Riemannian geometry. Chapter I explains basic definitions and gives the proofs of the important theorems of Whitney and Sard. Chapter II deals with vector fields and differential forms. Chapter III addresses integration of vector fields and p-plane fields. Chapter IV develops the notion of connection on a Riemannian manifold considered as a means to define parallel transport on the manifold. The author also discusses related notions of torsion and curvature, and gives a working knowledge of the covariant

derivative. Chapter V specializes on Riemannian manifolds by deducing global properties from local properties of curvature, the final goal being to determine the manifold completely. Chapter VI explores some problems in PDEs suggested by the geometry of manifolds. The author is well-known for his significant contributions to the field of geometry and PDEs - particularly for his work on the Yamabe problem - and for his expository accounts on the subject. The text contains many problems and solutions, permitting the reader to apply the theorems and to see concrete developments of the abstract theory.

Differential Geometry and Lie Groups Springer Science & Business Media

The second edition of An Introduction to Differentiable Manifolds and Riemannian Geometry, Revised has sold over 6,000 copies since publication in 1986 and this revision will make it even more useful. This is the only book available that is approachable by "beginners" in this subject. It has become an essential introduction to the subject for mathematics students, engineers, physicists, and economists who need to learn how to apply these vital methods. It is also the only book that thoroughly reviews certain areas of advanced calculus that are necessary to understand the subject. Line and surface integrals Divergence and curl of vector fields

Methods of Information Geometry Springer Science & Business Media

An introductory textbook on cohomology and curvature with emphasis on applications.

Metric Structures in Differential Geometry Springer Science & Business Media

In recent years, considerable progress has been made in studying algebraic cycles using infinitesimal methods. These methods have usually been applied to Hodge-theoretic constructions such as the cycle class and the Abel-Jacobi map. Substantial advances have also occurred in the infinitesimal theory for subvarieties of a given smooth variety, centered around the normal bundle and the obstructions coming from the normal bundle's first cohomology group. Here, Mark Green and Phillip Griffiths set forth the initial stages of an infinitesimal theory for algebraic cycles. The book aims in part to understand the geometric basis and the limitations of Spencer Bloch's beautiful formula for the tangent space to Chow groups. Bloch's formula is motivated by algebraic K-theory and involves differentials over Q. The theory developed here is characterized by the appearance of arithmetic considerations even in the local infinitesimal theory of algebraic cycles. The map from the tangent space to the Hilbert scheme to the tangent space to algebraic cycles passes through a variant of an interesting construction in commutative algebra due to Angéniol and Lejeune-Jalabert. The link between the theory given here and Bloch's formula arises from an interpretation of the Cousin flasque resolution of differentials over Q as the tangent sequence to the Gersten resolution in algebraic K-theory. The case of 0-cycles on a surface is used for illustrative purposes to avoid undue technical complications.

Elementary Differential Geometry Cambridge University Press

Holomorphic vector bundles have become objects of interest not only to algebraic and differential geometers and complex analysts but also to low dimensional topologists and mathematical physicists working on gauge theory. This book, which grew out of the author's lectures and seminars in Berkeley and Japan, is written for researchers and graduate students in these various fields of mathematics. Originally published in 1987. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

The Geometry of Moduli Spaces of Sheaves American Mathematical Soc.

Classical mechanics, one of the oldest branches of science, has undergone a long evolution, developing hand in hand with many areas of mathematics, including calculus, differential geometry, and the theory of Lie groups and Lie algebras. The modern formulations of Lagrangian and Hamiltonian mechanics, in the coordinate-free language of differential geometry, are elegant and general. They provide a unifying framework for many seemingly disparate physical systems, such as n particle systems, rigid bodies, fluids and other continua, and electromagnetic and quantum systems. Geometric Mechanics and Symmetry is a friendly and fast-paced introduction to the geometric approach to classical mechanics, suitable for a one- or two- semester course for beginning graduate students or advanced undergraduates. It fills a gap between traditional classical mechanics texts and advanced modern mathematical treatments of the subject. After a summary of the necessary elements of calculus on smooth manifolds and basic Lie group theory, the main body of the text considers how symmetry reduction of Hamilton's principle allows one to derive and analyze the Euler-Poincaré equations for dynamics on Lie groups. Additional topics deal with rigid and pseudo-rigid bodies, the heavy top, shallow water waves, geophysical fluid dynamics and computational anatomy. The text ends with a discussion of the semidirect-product Euler-Poincaré reduction theorem for ideal fluid dynamics. A variety of examples and figures illustrate the material, while the many exercises, both solved and unsolved, make the book a valuable class text.

Topology from the Differentiable Viewpoint American Mathematical Soc.

This elegant book by distinguished mathematician John Milnor, provides a clear and succinct introduction to one of the most important subjects in modern mathematics. Beginning with basic concepts such as diffeomorphisms and smooth manifolds, he goes on to examine tangent spaces, oriented manifolds, and vector fields. Key concepts such as homotopy, the index number of a map, and the Pontryagin construction are discussed. The author presents proofs of Sard's theorem and the Hopf theorem.

Notes on Crystalline Cohomology. (MN-21) American Mathematical Soc.

* Presents a comprehensive treatment with a global view of the subject * Rich in examples, problems with hints, and solutions, the book makes a welcome addition to the library of every mathematician

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