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Loring W. Tu

An Introduction to Manifolds

Second Edition

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Equivariant cohomology is concerned with the algebraic topology of spaces with a group action or in other words with symmetries of spaces First defined in the 1950s it has been introduced into K theory and algebraic geometry but it is in algebraic topology that the concepts are the most transparent and the proofs are the simplest One of the most useful applications of equivariant cohomology is the equivariant localization theorem of Atiyah Bott and Berline Vergne which converts the integral of an equivariant differential form into a finite sum over the fixed point set of the group action providing a powerful tool for computing integrals over a manifold Because integrals and symmetries are ubiquitous equivariant cohomology has found applications in diverse areas of mathematics and physics Assuming readers have taken one semester of manifold theory and a year of algebraic topology Loring Tu begins with the topological construction of equivariant cohomology then develops the theory for smooth manifolds with the aid of differential forms To keep the exposition simple the equivariant localization theorem is proven only for a circle action An appendix gives a proof of the equivariant de Rham theorem demonstrating that equivariant cohomology can be computed using equivariant differential forms Examples and calculations illustrate new concepts Exercises include hints or solutions making this book suitable for self study

Fundamentals of Tensor Calculus for Engineers with a Primer on Smooth Manifolds Uwe Mühlich, 2017-04-18 This book presents the fundamentals of modern tensor calculus for students in engineering and applied physics emphasizing those aspects that are crucial for applying tensor calculus safely in Euclidian space and for grasping the very essence of the smooth manifold concept After introducing the subject it provides a brief exposition on point set topology to familiarize readers with the subject especially with those topics required in later chapters It then describes the finite dimensional real vector space and its dual focusing on the usefulness of the latter for encoding duality concepts in physics Moreover it introduces tensors as objects that encode linear mappings and discusses affine and Euclidean spaces Tensor analysis is explored first in Euclidean space starting from a generalization of the concept of differentiability and proceeding towards concepts such as directional derivative covariant derivative and integration based on differential forms The final chapter addresses the role of smooth manifolds in modeling spaces other than Euclidean space particularly the concepts of smooth atlas and tangent space which are crucial to understanding the topic Two of the most important concepts namely the tangent bundle and the Lie derivative are subsequently worked out

An Introduction to the Analysis of Paths on a Riemannian Manifold Daniel W. Stroock, 2000 Hoping to make the text more accessible to readers not schooled in the probabilistic tradition Stroock affiliation unspecified emphasizes the geometric over the stochastic analysis of differential manifolds Chapters deconstruct Brownian paths diffusions in Euclidean space intrinsic and extrinsic Riemannian geometry Bocher's identity and the bundle of orthonormal frames The volume humbly concludes with an admission of defeat in regard to recovering the Li Yau basic differential inequality Annotation copyrighted by Book News Inc Portland OR

Wilson Lines in Quantum Field Theory Igor Olegovich Cherednikov, Tom Mertens, Frederik Van der Veken, 2019-12-02 The objective of this book is to get the reader

acquainted with theoretical and mathematical foundations of the concept of Wilson loops in the context of modern quantum field theory It offers an introduction to calculations with Wilson lines and shows the recent development of the subject in different important areas of research within the historical context

Differential Geometry and Lie Groups

Jean Gallier, Jocelyn Quaintance, 2020-08-18 This textbook explores advanced topics in differential geometry chosen for their particular relevance to modern geometry processing Analytic and algebraic perspectives augment core topics with the authors taking care to motivate each new concept Whether working toward theoretical or applied questions readers will appreciate this accessible exploration of the mathematical concepts behind many modern applications Beginning with an in depth study of tensors and differential forms the authors go on to explore a selection of topics that showcase these tools An analytic theme unites the early chapters which cover distributions integration on manifolds and Lie groups spherical harmonics and operators on Riemannian manifolds An exploration of bundles follows from definitions to connections and curvature in vector bundles culminating in a glimpse of Pontrjagin and Chern classes The final chapter on Clifford algebras and Clifford groups draws the book to an algebraic conclusion which can be seen as a generalized viewpoint of the quaternions Differential Geometry and Lie Groups A Second Course captures the mathematical theory needed for advanced study in differential geometry with a view to furthering geometry processing capabilities Suited to classroom use or independent study the text will appeal to students and professionals alike A first course in differential geometry is assumed the authors companion volume Differential Geometry and Lie Groups A Computational Perspective provides the ideal preparation

Introduction to Smooth Manifolds

John Lee, 2012-08-27 This book is an introductory graduate level textbook on the theory of smooth manifolds Its goal is to familiarize students with the tools they will need in order to use manifolds in mathematical or scientific research smooth structures tangent vectors and covectors vector bundles immersed and embedded submanifolds tensors differential forms de Rham cohomology vector fields flows foliations Lie derivatives Lie groups Lie algebras and more The approach is as concrete as possible with pictures and intuitive discussions of how one should think geometrically about the abstract concepts while making full use of the powerful tools that modern mathematics has to offer This second edition has been extensively revised and clarified and the topics have been substantially rearranged The book now introduces the two most important analytic tools the rank theorem and the fundamental theorem on flows much earlier so that they can be used throughout the book A few new topics have been added notably Sard's theorem and transversality a proof that infinitesimal Lie group actions generate global group actions a more thorough study of first order partial differential equations a brief treatment of degree theory for smooth maps between compact manifolds and an introduction to contact structures Prerequisites include a solid acquaintance with general topology the fundamental group and covering spaces as well as basic undergraduate linear algebra and real analysis

Geometric Methods and

Applications Jean Gallier, 2012-12-06 As an introduction to fundamental geometric concepts and tools needed for solving

problems of a geometric nature using a computer this book attempts to fill the gap between standard geometry books which are primarily theoretical and applied books on computer graphics computer vision or robotics which sometimes do not cover the underlying geometric concepts in detail Gallier offers an introduction to affine geometry projective geometry Euclidean geometry basics of differential geometry and Lie groups and a glimpse of computational geometry convex sets Voronoi diagrams and Delaunay triangulations and explores many of the practical applications of geometry Some of these applications include computer vision camera calibration efficient communication error correcting codes cryptography motion interpolation and robot kinematics This comprehensive text covers most of the geometric background needed for conducting research in computer graphics geometric modeling computer vision and robotics and as such will be of interest to a wide audience including computer scientists mathematicians and engineers

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