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Topology Springer Science & Business Media

This book explores several important aspects of recent developments in the interdisciplinary applications of mathematical analysis (MA), and highlights how MA is now being employed in many areas of scientific research. Each of the 23 carefully reviewed chapters was written by experienced expert(s) in respective field, and will enrich readers ’ understanding of the respective research problems, providing them with sufficient background to understand the theories, methods and applications discussed. The book ’ s main goal is to highlight the latest trends and advances, equipping interested readers to pursue further research of their own. Given its scope, the book will especially benefit graduate and PhD students, researchers in the applied sciences, educators, and engineers with an interest in recent developments in the interdisciplinary applications of mathematical analysis.

Elements Of Algebraic Topology Springer Nature

This text explains nontrivial applications of metric space topology to analysis. Covers metric space, point-set topology, and algebraic topology. Includes exercises, selected answers, and 51 illustrations. 1983 edition.

Topology from the Differentiable Viewpoint Courier Corporation

Based on Fields medal winning work of Michael Freedman, this book explores the disc embedding theorem for 4-dimensional manifolds. This theorem underpins virtually all our understanding of topological 4-manifolds. Most famously, this includes the 4-dimensional Poincar é conjecture in the topological category. The Disc Embedding Theorem contains the first thorough and approachable exposition of Freedman's proof of the disc embedding theorem, with many new details. A self-contained account of decomposition space theory, a beautiful but outmoded branch of topology that produces non-differentiable homeomorphisms between manifolds, is provided, as well as a stand-alone interlude that explains the disc embedding theorem's key role in all known homeomorphism classifications of 4-manifolds via surgery theory and the s-cobordism theorem. Additionally, the ramifications of the disc embedding theorem within the study of topological 4-manifolds, for example Frank Quinn's development of fundamental tools like transversality are broadly described. The book is written for mathematicians, within the subfield of topology, specifically interested in the study of 4-dimensional spaces, and includes numerous professionally rendered figures.

Functional Analysis. Sobolev Spaces and Partial Differential Equations McGraw-Hill Science, Engineering & Mathematics

Manifolds play an important role in topology, geometry, complex analysis, algebra, and classical mechanics. Learning manifolds differs from most other introductory mathematics in that the subject matter is often completely unfamiliar. This introduction guides readers by explaining the roles manifolds play in diverse branches of mathematics and physics. The book begins with the basics of general topology and gently moves to manifolds, the fundamental group, and covering spaces.

Schaum's Outline of Theory and Problems of General Topology Courier Dover Publications

Geometry of Manifolds

Geometry of Manifolds CRC Press

Topology is one of the most rapidly expanding areas of mathematical thought: while its roots are in geometry and analysis, topology now serves as a powerful tool in almost every sphere of mathematical study. This book is intended as a first text in topology, accessible to readers with at least three semesters of a calculus and analytic geometry sequence. In addition to superb coverage of the fundamentals of metric spaces, topologies, convergence, compactness, connectedness, homotopy theory, and other essentials, Elementary Topology gives added perspective as the author demonstrates how abstract topological notions developed from classical mathematics. For this second edition, numerous exercises have been added as well as a section dealing with paracompactness and complete regularity. The Appendix on infinite products has been extended to include the general Tychonoff theorem; a proof of the Tychonoff theorem which does not depend on the theory of convergence has also been added in Chapter 7.

Topological Persistence in Geometry and Analysis Springer Nature

Algebraic Topology is an introductory textbook based on a class for advanced high-school students at the Stanford University Mathematics Camp (SUMaC) that the authors have taught for many years. Each chapter, or lecture, corresponds to one day of class at SUMaC. The book begins with the preliminaries needed for the formal definition of a surface. Other topics covered in the book include the classification of surfaces, group theory, the fundamental group, and homology. This book assumes no background in abstract algebra or real analysis, and the material from those subjects is presented as needed in the text. This makes the book readable to undergraduates or high-school students who do not have the background typically assumed in an algebraic topology book or class. The book contains many examples and exercises, allowing it to be used for both self-study and for an introductory undergraduate topology course.

Elementary Topology University of Chicago Press

This text contains a detailed introduction to general topology and an introduction to algebraic topology via its most classical and elementary segment. Proofs of theorems are separated from their formulations and are gathered at the end of each chapter, making this book appear like a problem book and also giving it appeal to the expert as a handbook. The book includes about 1,000 exercises. Current Trends in Mathematical Analysis and Its Interdisciplinary Applications Springer Science & Business Media

A rigorous introduction to geometric and topological inference, for anyone interested in a geometric approach to data science. The Abel Prize 2008-2012 Springer Algebraic topology is a basic part of modern mathematics, and some knowledge of this area is indispensable for any advanced work relating to geometry, including topology itself, differential geometry, algebraic geometry, and Lie groups. This book provides a detailed treatment of algebraic topology both for teachers of the subject and for advanced graduate students in mathematics either specializing in this area or continuing on to other fields. J. Peter May's approach reflects the enormous internal developments within algebraic topology over the past several decades, most of which are largely unknown to mathematicians in other fields. But he also retains the classical presentations of various topics where appropriate. Most chapters end with problems that further explore and refine the concepts presented. The final four chapters provide sketches of substantial areas of algebraic topology that are normally omitted from introductory texts, and the book concludes with a list of suggested readings for those interested in delving further into the field.

Approximating Solutions in Infinite Horizon Optimization Cambridge University Press

This book addresses fixed point theory, a fascinating and far-reaching field with applications in several areas of mathematics. The content is divided into two main parts. The first, which is more theoretical, develops the main abstract theorems on the existence and uniqueness of fixed points of maps. In turn, the second part focuses on applications, covering a large variety of significant results ranging from ordinary differential equations in Banach spaces, to partial differential equations, operator theory, functional analysis, measure theory, and game theory. A final section containing 50 problems, many of which include helpful hints, rounds out the coverage. Intended for Master ’ s and PhD students in Mathematics or, more generally, mathematically oriented subjects, the book is designed to be largely self-contained, although some mathematical background is needed: readers should be familiar with measure theory, Banach and Hilbert spaces, locally convex topological vector spaces and, in general, with linear functional analysis.

Introduction to Topological Manifolds Dover Publications

This volume deals with the theory of finite topological spaces and its relationship with the homotopy and simple homotopy theory of polyhedra. The interaction between their intrinsic combinatorial and topological structures makes finite spaces a useful tool for studying problems in Topology, Algebra and Geometry from a new perspective. In particular, the methods developed in this manuscript are used to study Quillen's conjecture on the poset of p-subgroups of a finite group and the Andrews-Curtis conjecture on the 3-deformability of contractible two-dimensional complexes. This self-contained work constitutes the first detailed exposition on the algebraic topology of finite spaces. It is intended for topologists and combinatorialists, but it is also recommended for advanced undergraduate students and graduate students with a modest knowledge of Algebraic Topology.

Parametric Lie Group Actions on Global Generalised Solutions of Nonlinear PDEs Oxford University Press

Covering the years 2008-2012, this book profiles the life and work of recent winners of the Abel Prize: · John G. Thompson and Jacques Tits, 2008 · Mikhail Gromov, 2009 · John T. Tate Jr., 2010 · John W. Milnor, 2011 · Endre Szemer é di, 2012. The profiles feature autobiographical information as well as a description of each mathematician's work. In addition, each profile contains a complete bibliography, a curriculum vitae, as well as photos — old and new. As an added feature, interviews with the Laureates are presented on an accompanying web site (http://extras.springer.com/). The book also presents a history of the Abel Prize written by the historian Kim Helsvig, and includes a facsimile of a letter from Niels Henrik Abel, which is transcribed, translated into English, and placed into historical perspective by Christian Skau. This book follows on The Abel Prize: 2003-2007, The First Five Years (Springer, 2010), which profiles the work of the first Abel Prize winners.

Springer Science & Business Media

Sheldon Davis' text is written for introductory courses in topology taken by advanced undergraduate and beginning graduate students. Designed to be flexible, the text is divided into two parts to accomodate different courses, course configurations, and instructor preferences. Part I of the text covers the bare essentials every student should know about topology before continuing on to study point-set or set-theoretic topology, algebraic topology, funcitonal analysis, continuum theory, or the many other important areas in mathematics that utilize topology fundamentals. To keep the text manageable for beginning students, use of set theory in Part I is kept to an intuitive level. Part II contains a complete beginning course in general topology, or set-theoretic topology. General topology courses that assume prior background in the fundamentals can start directly with Part II and use the material in Part I for conceptual review. This text is part of the Walter Rudin Student Series in Advanced Mathematics.

Algebraic Topology Walter de Gruyter GmbH & Co KG

In 1848 James Challis showed that smooth solutions to the compressible Euler equations can become multivalued, thus signifying the onset of a shock singularity. Today it is known that, for many hyperbolic systems, such singularities often develop. However, most shock-formation results have been proved only in one spatial dimension. Serge Alinhac's groundbreaking work on wave equations in the late 1990s was the first to treat more than one spatial dimension. In 2007, for the compressible Euler equations in vorticity-free regions, Demetrios Christodoulou remarkably sharpened Alinhac's results and gave a complete description of shock formation. In this monograph, Christodoulou's framework is extended to two classes of wave equations in three spatial dimensions. It is shown that if the nonlinear terms fail to satisfy the null condition, then for small data, shocks are the only possible singularities that can develop. Moreover, the author exhibits an open set of small data whose solutions form a shock, and he provides a sharp description of the blow-up. These results yield a sharp converse of the fundamental result of Christodoulou and Klainerman, who showed that small-data solutions are global when the null condition is satisfied. Readers who master the material will have acquired tools on the cutting edge of PDEs, fluid mechanics, hyperbolic conservation laws, wave equations, and geometric analysis.

Evolutionary Multi-Criterion Optimization American Mathematical Soc.
A readable introduction to the subject of calculus on arbitrary surfaces or manifolds. Accessible to readers with knowledge of basic calculus and linear algebra. Sections include series of problems to reinforce concepts.

Topology and Geometry in Physics Prentice Hall
The book is intended as a text for a one-semester graduate course in operator theory to be taught "from scratch", not as a sequel to a functional analysis course, with the basics of the spectral theory of linear operators taking the center stage. The book consists of six chapters and appendix, with the material flowing from the fundamentals of abstract spaces (metric, vector, normed vector, and inner product), the Banach Fixed-Point Theorem and its applications, such as Picard's Existence and Uniqueness Theorem, through the basics of linear operators, two of the three fundamental principles (the Uniform Boundedness Principle and the Open Mapping Theorem and its equivalents: the Inverse Mapping and Closed Graph Theorems), to the elements of the spectral theory, including Gelfand's Spectral Radius Theorem and the Spectral Theorem for Compact Self-Adjoint Operators, and its applications, such as the celebrated Lyapunov Stability Theorem. Conceived as a text to be used in a classroom, the book constantly calls for the student's actively mastering the knowledge of the subject matter. There are problems at the end of each chapter, starting with Chapter 2 and totaling at 150. Many important statements are given as problems and frequently referred to in the main body. There are also 432 Exercises throughout the text, including Chapter 1 and the Appendix, which require of the student to prove or verify a statement or an example, fill in certain details in a proof, or provide an intermediate step or a counterexample. They are also an inherent part of the material. More difficult problems are marked with an asterisk, many problems and exercises are supplied with "existential" hints. The book is generous on Examples and contains numerous Remarks accompanying definitions, examples, and statements to discuss certain subtleties, raise questions on whether the converse assertions are true, whenever appropriate, or whether the conditions are essential. With carefully chosen material, proper attention given to applications, and plenty of examples, problems, and exercises, this well-designed text is ideal for a one-semester Master's level graduate course in operator theory with emphasis on spectral theory for students majoring in mathematics, physics, computer science, and engineering. Contents Preface Preliminaries Metric Spaces Vector Spaces, Normed Vector Spaces, and Banach Spaces Linear Operators Elements of Spectral Theory in a Banach Space Setting Elements of Spectral Theory in a Hilbert Space Setting Appendix: The Axiom of Choice and Equivalents Bibliography Index

Atomistic Spin Dynamics CRC Press
This book presents a geometric introduction to the homology of topological spaces and the cohomology of smooth manifolds. The author introduces a new class of stratified spaces, so-called stratifolds. He derives basic concepts from differential topology such as Sard's theorem, partitions of unity and transversality. Based on this, homology groups are constructed in the framework of stratifolds and the homology axioms are proved. This implies that for nice spaces these homology groups agree with ordinary singular homology. Besides the standard computations of homology groups using the axioms, straightforward constructions of important homology classes are given. The author also defines stratifold cohomology groups following an idea of Quillen. Again, certain important cohomology classes occur very naturally in this description, for example, the characteristic classes which are constructed in the book and applied later on. One of the most fundamental results, Poincare duality, is almost a triviality in this approach. Some fundamental invariants, such as the Euler characteristic and the signature, are derived from (co)homology groups. These invariants play a significant role in some of the most spectacular results in differential topology. In particular, the author proves a special case of Hirzebruch's signature theorem and presents as a highlight Milnor's exotic 7-spheres. This book is based on courses the author taught in Mainz and Heidelberg. Readers should be familiar with the basic notions of point-set topology and differential topology. The book can be used for a combined introduction to differential and algebraic topology, as well as for a quick presentation of (co)homology in a course about differential geometry.

Differential Algebraic Topology American Mathematical Soc.
This book constitutes the refereed proceedings of the 11th International Conference on Evolutionary Multi-Criterion Optimization, EMO 2021 held in Shenzhen, China, in March 2021. The 47 full papers and 14 short papers were carefully reviewed and selected from 120 submissions. The papers are divided into the following topical sections: theory; algorithms; dynamic multi-objective optimization; constrained multi-objective optimization; multi-modal optimization; many-objective optimization; performance evaluations and empirical studies; EMO and machine learning; surrogate modeling and expensive optimization; MCDM and interactive EMO; and applications.

A Concise Course in Algebraic Topology CRC Press
Elements of Algebraic Topology provides the most concrete approach to the subject. With coverage of homology and cohomology theory, universal coefficient theorems, Kunneth theorem, duality in manifolds, and applications to classical theorems of point-set topology, this book is perfect for communicating complex topics and the fun nature of algebraic topology for beginners.