

Topological Methods In Data Analysis And Visualization Iii Theory Algorithms And Applications Mathematics And Visualization

Data analysis as an area of importance has grown exponentially, especially during the past couple of decades. This can be attributed to a rapidly growing computer industry and the wide applicability of computational techniques, in conjunction with new advances of analytic tools. This being the case, the need for literature that addresses this is self-evident. New publications are appearing, covering the need for information from all fields of science and engineering, thanks to the universal relevance of data analysis and statistics packages. This book is a collective work by a number of leading scientists, analysts, engineers, mathematicians and statisticians who have been working at the forefront of data analysis. The chapters included in this volume represent a cross-section of current concerns and research interests in these scientific areas. The material is divided into two parts: Computational Data Analysis, and Classification Data Analysis, with methods for both - providing the reader with both theoretical and applied information on data analysis methods, models and techniques and appropriate applications.

This book presents the latest research on the statistical analysis of functional, high-dimensional and other complex data, addressing methodological and computational aspects, as well as real-world applications. It covers topics like classification, confidence bands, density estimation, depth, diagnostic tests, dimension reduction, estimation on manifolds, high- and infinite-dimensional statistics, inference on functional data, networks, operatorial statistics, prediction, regression, robustness, sequential learning, small-ball probability, smoothing, spatial data, testing, and topological object data analysis, and includes applications in automobile engineering, criminology, drawing recognition, economics, environmetrics, medicine, mobile phone data, spectrometrics and urban environments. The book gathers selected, refereed contributions presented at the Fifth International Workshop on Functional and Operatorial Statistics (IWFOS) in Brno, Czech Republic. The workshop was originally to be held on June 24-26, 2020, but had to be postponed as a consequence of the COVID-19 pandemic. Initiated by the Working Group on Functional and Operatorial Statistics at the University of Toulouse in 2008, the IWFOS workshops provide a forum to discuss the latest trends and advances in functional statistics and related fields, and foster the exchange of ideas and international collaboration in the field.

This book presents 13 peer-reviewed papers as written results from the 2005 workshop "Topology-Based Methods in Visualization" that was initiated to enable additional stimulation in this field. It contains a survey of the state-of-the-art, as well original work by leading experts that has not been published before, spanning both theory and applications. It captures key concepts and novel ideas and serves as an overview of current trends in its subject.

This book collects select papers presented at the International Workshop and Conference on Topology & Applications, held in Kochi, India, from 9-11 December 2018. The book discusses topics on topological dynamical systems and topological data analysis. Topics are ranging from general topology, algebraic topology, differential topology, fuzzy topology, topological dynamical systems, topological groups, linear dynamics, dynamics of operator network topology, iterated function systems and applications of topology. All contributing authors are eminent academicians, scientists, researchers and scholars in their respective fields, hailing from around the world. The book is a valuable resource for researchers, scientists and engineers from both academia and industry.

Interactive Knowledge Discovery and Data Mining in Biomedical Informatics

Theory, Algorithms, and Applications

Computational Topology

State-of-the-Art and Future Challenges

IWCTA 2018, Kochi, India, December 9-11

A rigorous introduction to geometric and topological inference, for anyone interested in a geometric approach to data science.

This collection of peer-reviewed conference papers provides comprehensive coverage of cutting-edge research in topological approaches to data analysis and visualization. It encompasses the full range of new algorithms and insights, including fast homology computation, comparative analysis of simplification techniques, and key applications in materials and medical science. The volume also features material on core research challenges such as the representation of large and complex datasets and integrating numerical methods with robust combinatorial algorithms. Reflecting the focus of the TopoInVis 2013 conference, the contributions evince the progress currently being made on finding experimental solutions to open problems in the sector. They provide an inclusive snapshot of state-of-the-art research that enables researchers to keep abreast of the latest developments and provides a foundation for future progress. With papers by some of the world's leading experts in topological techniques, this volume is a major contribution to the literature in a field of growing importance with applications in disciplines that range from engineering to medicine.

This book presents contributions on topics ranging from novel applications of topological analysis for particular problems, through studies of the effectiveness of modern topological methods,

algorithmic improvements on existing methods, and parallel computation of topological structures, all the way to mathematical topologies not previously applied to data analysis. Topological methods are broadly recognized as valuable tools for analyzing the ever-increasing flood of data generated by simulation or acquisition. This is particularly the case in scientific visualization, where the data sets have long since surpassed the ability of the human mind to absorb every single byte of data. The biannual TopoInVis workshop has supported researchers in this area for a decade, and continues to serve as a vital forum for the presentation and discussion of novel results in applications in the area, creating a platform to disseminate knowledge about such implementations throughout and beyond the community. The present volume, resulting from the 2015 TopoInVis workshop held in Annweiler, Germany, will appeal to researchers in the fields of scientific visualization and mathematics, domain scientists with an interest in advanced visualization methods, and developers of visualization software systems.

Combining theoretical and practical aspects of topology, this book provides a comprehensive and self-contained introduction to topological methods for the analysis and visualization of scientific data. Theoretical concepts are presented in a painstaking but intuitive manner, with numerous high-quality color illustrations. Key algorithms for the computation and simplification of topological data representations are described in detail, and their application is carefully demonstrated in a chapter dedicated to concrete use cases. With its fine balance between theory and practice, "Topological Data Analysis for Scientific Visualization" constitutes an appealing introduction to the increasingly important topic of topological data analysis for lecturers, students and researchers.

Topological Methods in Data Analysis and Visualization II

Computational, Classification, Financial, Statistical and Stochastic Methods

Advances in Intelligent Networking and Collaborative Systems

Differential Geometry and Statistics

Computational Topology for Data Analysis

Signal Processing and Machine Learning for Biomedical Big Data

Persistence theory emerged in the early 2000s as a new theory in the area of applied and computational topology. This book provides a broad and modern view of the subject, including both theoretical and algorithmic aspects. It also elaborates on applications in data analysis. The level of detail of the exposition has been set so as to keep a survey style, while providing sufficient detail so that the reader can understand the mechanisms at work. The book is organized into three parts. The first part is dedicated to the foundations of persistence and emphasizes its connections to other areas of topology. The second part focuses on its connection to applications through a few selected topics. The third part provides perspectives for both the theory and its applications. The book concludes with a chapter on applied topology or data analysis.

An introduction to geometric and topological methods to analyze large scale biological data; includes statistics and genomic applications.

Complexity of Seismic Time Series: Measurement and Application applies the tools of nonlinear dynamics to seismic analysis, allowing for the revelation of new details in micro-seismic noise, and new tools for prediction of seismic events. The book summarizes both advances and applications in the field, thus meeting the needs of both fundamental and applied researchers. The needs of the classical field and the very modern terms of complexity science, this book covers theory and its application to advanced nonlinear time series tools to investigate Earth's seismicity. A valuable tool for seismologists, hazard managers and engineers. Covers the topic of Earth's vibrations involving many different aspects of theoretical and observational seismology. Describes different advanced nonlinear time series tools for the characterization of these Earth's signals Merges the needs of geophysics with the applications of complexity theory Describes different problems, not only in the context of geosciences, but also those associated with different complex systems across disciplines

The theory of persistence modules originated in topological data analysis and became an active area of research in algebraic topology. This book provides a concise and self-contained introduction to persistence modules and focuses on their interactions with pure mathematics, bringing the reader to the cutting edge of current research. In particular, the authors present applications to symplectic topology, including the geometry of symplectomorphism groups and embedding problems. Furthermore, they discuss topological function theory, which provides new insights into the theory of functions. The book is accessible to readers with a basic background in algebraic and differential topology.

An Introduction to Geographical Information Science

Handbook of Discrete and Computational Geometry, Third Edition

Advances in Applied and Computational Topology

Applications of Topological Methods in Molecular Chemistry

A Short Course in Computational Geometry and Topology

The 9th International Conference on Intelligent Networking and Collaborative Systems (INCoS-2017)

Combining concepts from topology and algorithms, this book delivers what its title promises: an introduction to the field of computational topology. Starting with mathematical foundations in mathematics and computer science and building up from classic topics in geometric and algebraic topology, the third part of the text advances to persistent homology, which is critically important in turning a mostly theoretical field of mathematics into one that is relevant to a multitude of disciplines in the sciences and engineering. The major contribution of the book is the discovery of topology through algorithms. The book is ideal for teaching a graduate or advanced undergraduate course in computational topology, as it develops all the mathematical and algorithmic aspects of the subject from first principles. Thus the text could serve equally well in a course taught in a mathematics department or a computer science department.

This open access book brings out the state of the art on how informatics-based tools are used and expected to be used in nanomaterials research. There has been a significant increase in the amount of data generated, which "big-data" generated by experiments or computations are fully utilized to accelerate discovery of new materials, key factors, and design rules. Data-intensive research is becoming a key factor in the development of new materials.

indispensable roles in advanced materials characterization. "Materials informatics" is the central paradigm in the new trend. "Nanoinformatics" is its essential subset nanostructures of materials such as surfaces, interfaces, dopants, and point defects, playing a critical role in determining materials properties. There have been significant experimental and computational techniques to characterize individual atoms in nanostructures and to gain quantitative information. The collaboration of researchers in information science is growing actively and is creating a new trend in materials science and engineering.

This timely text introduces topological data analysis from scratch, with detailed case studies.

Several years ago our statistical friends and relations introduced us to the work of Amari and Barndorff-Nielsen on applications of differential geometry to statistics because we believe that there is a deep relationship between statistics and differential geometry and moreover that this relationship uses parts of differential geometry of order' aspects not readily accessible to a statistical audience from the existing literature. It is, in part, a long reply to the frequent requests we have had for reference. While we have not gone beyond the path-breaking work of Amari and Barndorff-Nielsen in the realm of applications, our book gives some new explanations of their principles point of view as far as geometry is concerned. In particular it seeks to explain why geometry should enter into parametric statistics, and how the theory involves a form of higher-order differential geometry. The first chapter of the book explores exponential families as flat geometries. Indeed the whole notion of using to exploiting a particular form of flat space known as an affine geometry, in which straight lines and planes make sense, but lengths and angles are absent. We use to introduce the notion of the second fundamental form of a family whose vanishing characterises precisely the exponential families.

An Introduction

Discrete and Topological Models in Molecular Biology

Topological Methods for the Representation and Analysis of Exploration Data in Oil Industry

Computational Topology for Biomedical Image and Data Analysis

Topological Methods in Data Analysis and Visualization

Computational Homology

"In this chapter, we introduce some of the very basics that are used throughout the book. First, we give the definition of a topological space and related notions of open and closed sets, covers, subspace topology. To connect topology and geometry, we devote a section on metric spaces. Maps such as homeomorphism and homotopy equivalence that play a significant role to relate topological spaces. Certain categories of topological spaces become important for their wide presence in applications. Manifolds are one such category which we introduce in this chapter. Functions on them satisfying certain conditions are presented as Morse functions. The critical points of such functions relate to the topology of the manifold they are defined on. We introduce these concepts in the smooth setting in this chapter, and later adapt them for the piecewise linear domains frequently used for finite computations. Finally, a section on Notes points out to the history and relevant literature for the concepts delineated in the chapter. It ends with a series of exercises that may be used for teaching a class on the subject both at graduate and undergraduate level"--

When scientists analyze datasets in a search for underlying phenomena, patterns or causal factors, their first step is often an automatic or semi-automatic search for structures in the data. Of these feature-extraction methods, topological ones stand out due to their solid mathematical foundation. Topologically defined structures—as found in scalar, vector and tensor fields—have proven their merit in a wide range of scientific domains, and scientists have found them to be revealing in subjects such as physics, engineering, and medicine. Full of state-of-the-art research and contemporary hot topics in the subject, this volume is a selection of peer-reviewed papers originally presented at the fourth Workshop on Topology-Based Methods in Data Analysis and Visualization, TopoInVis 2011, held in Zurich, Switzerland. The workshop brought together many of the leading lights in the field for a mixture of formal presentations and discussion. One topic currently generating a great deal of interest, and explored in several chapters here, is the search for topological structures in time-dependent flows, and their relationship with Lagrangian coherent structures. Contributors also focus on discrete topologies of scalar and vector fields, and on persistence-based simplification, among other issues of note. The new research results included in this volume relate to all three key areas in data analysis—theory, algorithms and applications.

In Geography and GIS, surfaces can be analysed and visualised through various data structures, and topological data structures describe surfaces in the form of a relationship between certain surface-specific features. Drawn from many disciplines with a strong applied aspect, this is a research-led, interdisciplinary approach to the creation, analysis and visualisation of surfaces, focussing on topological data structures. Topological Data Structures for Surfaces: an introduction for Geographical Information Science describes the concepts and applications of these data structures. The book focuses on how these data structures can be used to analyse and visualise surface datasets from a range of disciplines such as human geography, computer graphics, metrology, and physical geography. Divided into two Parts, Part I defines the topological surface data structures and explains the various automated methods used for their generation. Part II demonstrates a number of applications of surface networks in diverse fields, ranging from sub-atomic particle collision visualisation to the study of population density patterns. To ensure that the material is accessible, each Part is prefaced by an overview of the techniques and application. Provides GI scientists and geographers with an accessible overview of current surface topology research. Algorithms are presented and explained with practical examples of their usage. Features an accompanying website developed by the Editor - <http://geog.le.ac.uk/sanjayrana/surface-networks/> This book is invaluable for researchers and postgraduate students working in departments of GI Science, Geography and Computer Science. It also constitutes key reference material

for Masters students working on surface analysis projects as part of a GI Science or Computer Science programme.

Theoretical tools and insights from discrete mathematics, theoretical computer science, and topology now play essential roles in our understanding of vital biomolecular processes. The related methods are now employed in various fields of mathematical biology as instruments to "zoom in" on processes at a molecular level. This book contains expository chapters on how contemporary models from discrete mathematics – in domains such as algebra, combinatorics, and graph and knot theories – can provide perspective on biomolecular problems ranging from data analysis, molecular and gene arrangements and structures, and knotted DNA embeddings via spatial graph models to the dynamics and kinetics of molecular interactions. The contributing authors are among the leading scientists in this field and the book is a reference for researchers in mathematics and theoretical computer science who are engaged with modeling molecular and biological phenomena using discrete methods. It may also serve as a guide and supplement for graduate courses in mathematical biology or bioinformatics, introducing nontraditional aspects of mathematical biology.

Theory, Applications, and Software

Topological Persistence in Geometry and Analysis

Topological Data Analysis for Scientific Visualization

Topology-based Methods in Visualization

Topological Dynamics and Topological Data Analysis

Persistence Theory: From Quiver Representations to Data Analysis

Homology is a powerful tool used by mathematicians to study the properties of spaces and maps that are insensitive to small perturbations. This book uses a computer to develop a combinatorial computational approach to the subject. The core of the book deals with homology theory and its computation. Following this is a section containing extensions to further developments in algebraic topology, applications to computational dynamics, and applications to image processing. Included are exercises and software that can be used to compute homology groups and maps. The book will appeal to researchers and graduate students in mathematics, computer science, engineering, and nonlinear dynamics.

One of the grand challenges in our digital world are the large, complex and often weakly structured data sets, and massive amounts of unstructured information. This "big data" challenge is most evident in biomedical informatics: the trend towards precision medicine has resulted in an explosion in the amount of generated biomedical data sets. Despite the fact that human experts are very good at pattern recognition in dimensions of $n = 3$; most of the data is high-dimensional, which makes manual analysis often impossible and neither the medical doctor nor the biomedical researcher can memorize all these facts. A synergistic combination of methodologies and approaches of two fields offer ideal conditions towards unraveling these problems:

Human-Computer Interaction (HCI) and Knowledge Discovery/Data Mining (KDD), with the goal of supporting human capabilities with machine learning. This state-of-the-art survey is an output of the HCI-KDD expert network and features 19 carefully selected and reviewed papers related to seven hot and promising research areas: Area 1: Data Integration, Data Pre-processing and Data Mapping; Area 2: Data Mining Algorithms; Area 3: Graph-based Data Mining; Area 4: Entropy-Based Data Mining; Area 5: Topological Data Mining; Area 6 Data Visualization and Area 7: Privacy, Data Protection, Safety and Security.

This will be a comprehensive, multi-contributed reference work that will detail the latest research and developments in biomedical signal processing related to big data medical analysis. It will describe signal processing, machine learning, and parallel computing strategies to revolutionize the world of medical analytics and diagnosis as presented by world class researchers and experts in this important field. The chapters will describe tools that can be used by biomedical and clinical practitioners as well as industry professionals. It will give signal processing researchers a glimpse into the issues faced with Big Medical Data.

This book is a result of a workshop, the 8th of the successful TopoInVis workshop series, held in 2019 in Nyköping, Sweden. The workshop regularly gathers some of the world's leading experts in this field. Thereby, it provides a forum for discussions on the latest advances in the field with a focus on finding practical solutions to open problems in topological data analysis for visualization. The contributions provide introductory and novel research articles including new concepts for the analysis of multivariate and time-dependent data, robust computational approaches for the extraction and approximations of topological structures with theoretical guarantees, and applications of topological scalar and vector field analysis for visualization. The applications span a wide range of scientific areas comprising climate science, material sciences, fluid dynamics, and astronomy. In addition, community efforts with respect to joint software development are reported and discussed.

Functional and High-Dimensional Statistics and Related Fields

Complexity of Seismic Time Series

A Cp-Theory Problem Book

Topological Methods in Data Analysis and Visualization VI

Data Analysis and Applications 3

Theory and Applications

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.

The Handbook of Discrete and Computational Geometry is intended as a reference book fully accessible to nonspecialists as well as specialists, covering all major aspects of both fields. The book offers the most important results and methods in discrete and computational geometry to those who use them in their work, both in the academic world—as researchers in mathematics and computer science—and in the professional world—as practitioners in fields as diverse as operations research, molecular biology, and robotics. Discrete geometry has contributed significantly to the growth of discrete mathematics in recent years. This has been fueled partly by the advent of powerful computers and by the recent explosion of activity in the relatively young field of computational geometry. This synthesis between discrete and computational geometry lies at the heart of this Handbook. A growing list of application fields includes combinatorial optimization, computer-aided design, computer graphics, crystallography, data analysis, error-correcting codes, geographic information systems, motion planning, operations research, pattern recognition, robotics, solid modeling, and tomography.

This collection of peer-reviewed workshop papers provides comprehensive coverage of cutting-edge research into topological approaches to data analysis and visualization. It encompasses the full range of new algorithms and insights, including fast homology computation, comparative analysis of simplification techniques, and key applications in materials and medical science. The book also addresses core research challenges such as the representation of large and complex datasets, and integrating numerical methods with robust combinatorial algorithms. In keeping with the focus of the TopoInVis 2017 Workshop, the contributions reflect the latest advances in finding experimental solutions to open problems in the sector. They provide an essential snapshot of state-of-the-art research, helping researchers to keep abreast of the latest developments and providing a basis for future work. Gathering papers by some of the world's leading experts on topological techniques, the book represents a valuable contribution to a field of growing importance, with applications in disciplines ranging from engineering to medicine.

What is the shape of data? How do we describe flows? Can we count by integrating? How do we plan with uncertainty? What is the most compact representation? These questions, while unrelated, become similar when recast into a computational setting. Our input is a set of finite, discrete, noisy samples that describes an abstract space. Our goal is to compute qualitative features of the unknown space. It turns out that topology is sufficiently tolerant to provide us with robust tools. This volume is based on lectures delivered at the 2011 AMS Short Course on Computational Topology, held January 4-5, 2011 in New Orleans, Louisiana. The aim of the volume is to provide a broad introduction to recent techniques from applied and computational topology. Afra Zomorodian focuses on topological data analysis via efficient construction of combinatorial structures and recent theories of persistence. Marian Mrozek analyzes asymptotic behavior of dynamical systems via efficient computation of cubical homology. Justin Curry, Robert Ghrist, and Michael Robinson present Euler Calculus, an integral calculus based on the Euler characteristic, and apply it to sensor and network data aggregation. Michael Erdmann explores the relationship of topology, planning, and probability with the strategy complex. Jeff Erickson surveys algorithms and hardness results for topological optimization problems.

Topological and Function Spaces

Topological Data Structures for Surfaces

Topological Methods in Data Analysis and Visualization V

Elementary Applied Topology

Measurement and Application

American Mathematical Society Short Course on Computational Topology, January 4-5, 2011, New Orleans, Louisiana

Topology-based methods are of increasing importance in the analysis and visualization of datasets from a wide variety of scientific domains such as biology, physics, engineering, and medicine. Current challenges of topology-based techniques include the management of time-dependent data, the representation of large and complex datasets, the characterization of noise and uncertainty, the effective integration of numerical methods with robust combinatorial algorithms, etc. . The editors have brought together the most prominent and best recognized researchers in the field of topology-based data analysis and visualization for a joint discussion and scientific exchange of the latest results in the field. This book contains the best 20 peer-reviewed papers resulting from the discussions and presentations at the third workshop on "Topological Methods in Data Analysis and Visualization", held 2009 in Snowbird, Utah, US. The 2009 "TopoInVis" workshop follows the two successful workshops in 2005 (Slovakia) and 2007 (Germany).

The aim of this book is to provide the latest research findings, innovative research results, methods and development techniques from both theoretical and practical perspectives related to intelligent social networks and collaborative systems, intelligent networking systems, mobile collaborative systems, secure intelligent cloud systems, etc., and to reveal synergies among various paradigms in the multi-disciplinary field of intelligent collaborative systems. It presents the Proceedings of the 9th International Conference on Intelligent Networking and Collaborative Systems (INCoS-2017), held on August 24–26, 2017 in Toronto, Canada. With the rapid evolution of the Internet, we are currently experiencing a shift from the traditional sharing of information and applications as the main purpose of the Web to an emergent paradigm that puts people at the very centre of networks and exploits the value of people ' s connections, relations and collaborations. Social networks are also playing a major role in the dynamics and structure of intelligent Web-based networking and collaborative systems. Virtual campuses, virtual communities and organizations effectively leverage intelligent networking and collaborative systems by tapping into a broad range of formal and informal electronic relations, such as business-to-business, peer-to-peer and many types of online collaborative learning interactions, including the emerging e-learning systems. This has resulted in entangled systems that need to be managed efficiently and autonomously. In addition, the latest and powerful technologies based on Grid and wireless infrastructure as well as Cloud computing are now greatly enhancing collaborative and networking applications, but are also facing new issues and challenges. The principal objective of the research and development community is to stimulate research that leads to the creation of responsive environments for networking and, in the longer-term, the development of adaptive, secure, mobile, and intuitive intelligent systems for collaborative work and learning.

This monograph presents a short course in computational geometry and topology. In the first part the book covers Voronoi diagrams and Delaunay triangulations, then it presents the theory of alpha complexes which play a crucial role in biology. The central part of the book is the homology theory and their computation, including the theory of persistence which is indispensable for applications, e.g. shape reconstruction. The target audience comprises researchers and practitioners in mathematics, biology, neuroscience and computer science, but the book may also be beneficial to graduate students of these fields.

The first monograph to treat topological, group-theoretic, and geometric problems of ideal hydrodynamics and magnetohydrodynamics from a unified point of view. It describes the necessary preliminary notions both in hydrodynamics and pure mathematics with numerous examples and figures. The book is accessible to graduates as well as pure and applied mathematicians working in hydrodynamics, Lie groups, dynamical systems, and differential geometry.

Geometric and Topological Inference

Topological Data Analysis for Genomics and Evolution

Topological Methods in Data Analysis and Visualization III

Nanoinformatics

Topological Data Analysis with Applications

A Concise Course in Algebraic Topology

The theory of function spaces endowed with the topology of point wise convergence, or Cp-theory, exists at the intersection of three important areas of mathematics: topological algebra, functional analysis, and general topology. Cp-theory has an important role in the classification and unification of heterogeneous results from each of these areas of research. Through over 500 carefully selected problems and exercises, this volume provides a self-contained introduction to Cp-theory and general topology. By systematically introducing each of the major topics in Cp-theory, this volume is designed to bring a dedicated reader from basic topological principles to the frontiers of modern research. Key features include: - A unique problem-based introduction to the theory of function spaces. - Detailed solutions to each of the presented problems and exercises. - A comprehensive bibliography reflecting the state-of-the-art in modern Cp-theory. - Numerous open problems and directions for further research. This volume can be used as a textbook for courses in both Cp-theory and general topology as well as a reference guide for specialists studying Cp-theory and related topics. This book also provides numerous topics for PhD specialization as well as a large variety of material suitable for graduate research.

This is the first edited volume that features two important frameworks, Hückel and quantum chemical topological analyses. The contributors, which include an array of academics of international distinction, describe recent applications of such topological methods to various fields and topics that provide the reader with the current state-of-the-art and give a flavour of the wide range of their potentialities.

This book provides an accessible yet rigorous introduction to topology and homology focused on the simplicial space. It presents a compact pipeline from the foundations of topology to biomedical applications. It will be of interest to medical physicists, computer scientists, and engineers, as well as undergraduate and graduate students interested in this topic. Features: Presents a practical guide to algebraic topology as well as persistence homology

Contains application examples in the field of biomedicine, including the analysis of histological images and point cloud data

This book gives an introduction to the mathematics and applications comprising the new field of applied topology. The elements of this subject are surveyed in the context of applications drawn from the biological, economic, engineering, physical, and statistical sciences.

Topological Methods in Data Analysis and Visualization IV

Topological Methods in Hydrodynamics
Topology in Biology