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

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Topological Methods in Data Analysis and Visualization III - Peer-Timo Bremer 2014-04-22
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.

Topology-Based Methods in Visualization II - Hans-Christian Hege 2009-02-07
Visualization research aims to provide insight into large, complicated data sets and the phenomena behind them. While there are di?erent methods of reaching this goal, topological methods stand out for their solid mathem- ical foundation, which guides the algorithmic analysis and its presentation. Topology-based methods in visualization have been around since the beg- ning of visualization as a scienti?c discipline, but they initially played only a minor role. In recent years,interest in topology-basedvisualization has grown andsigni?cantinnovationhasledto newconceptsandsuccessfulapplications. The latest trends adapt basic topological concepts to precisely express user interests in topological properties of the data. This book is the outcome of the second workshop on Topological Methods in Visualization, which was held March 4–6, 2007 in Kloster Nimbschen near Leipzig,Germany.Theworkshopbroughttogethermorethan40international researchers to present and discuss the state of the art and new trends in the ?eld of topology-based visualization. Two inspiring invited talks by George Haller, MIT, and Nelson Max, LLNL, were accompanied by 14 presentations by participants and two panel discussions on current and future trends in visualization research. This book contains thirteen research papers that have been peer-reviewed in a two-stage review process. In the ?rst phase, submitted papers where peer-reviewed by the international program committee. After the workshop accepted papers went through a revision and a second review process taking into account comments from the ?rst round and discussions at the workshop. Abouthalfthepapersconcerntopology-basedanalysisandvisualizationof ?uid?owsimulations;twopapersconcernmoregeneraltopologicalalgorithms , while the remaining papers discuss topology-based visualization methods in application areas like biology, medical imaging and electromagnetism.

Topological Data Analysis for Scientific Visualization - Julien Tierny 2018-01-29
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 Data Analysis with Applications - Gunnar Carlsson 2021-12-16
This timely text introduces topological data analysis from scratch, with detailed case studies.

Topological Methods in Data Analysis and Visualization VI - Ingrid Hotz 2022-09-30
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.

Elementary Applied Topology - Robert Ghrist 2014-09-01
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.

Multivariate Network Visualization - Andreas Kerren 2014-04-15
This book is the outcome of the Dagstuhl Seminar 13201 on Information Visualization - Towards Multivariate Network Visualization, held in Dagstuhl Castle, Germany in May 2013. The goal of this Dagstuhl Seminar was to bring together theoreticians and practitioners from Information Visualization, HCI and Graph Drawing with a special focus on multivariate network visualization, i.e., on graphs where the nodes and/or edges have additional (multidimensional) attributes. The integration of multivariate data into complex networks and their visual analysis is one of the big challenges not only in visualization, but also in many application areas. Thus, in order to support discussions related to the visualization of real world data, also invited researchers from selected application areas, especially bioinformatics, social sciences and software engineering. The unique "Dagstuhl climate" ensured an open and undisturbed atmosphere to discuss the state-of-the-art, new directions and open challenges of multivariate network visualization.

Persistence Theory: From Quiver Representations to Data Analysis - Steve Y. Oudot 2015-12-02
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 its algebraic, topological, 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 insights into the proofs so 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 connection to quiver representation theory. 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 can be used as a text for a course on applied topology or data analysis.

Topological Methods in Data Analysis and Visualization VI - Ingrid Hotz 2021-10-30

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.

Biocomputing 2021 - Proceedings Of The Pacific Symposium - Russ B Altman 2020-11-24

The Pacific Symposium on Biocomputing (PSB) 2021 is an international, multidisciplinary conference for the presentation and discussion of current research in the theory and application of computational methods in problems of biological significance. Presentations are rigorously peer reviewed and are published in an archival proceedings volume. PSB 2021 will be held on a virtual platform at psb.stanford.edu/ on January 5-7, 2021. Tutorials and workshops will be offered prior to the start of the conference.PSB 2021 will bring together top researchers from the US, the Asian Pacific nations, and around the world to exchange research results and address open issues in all aspects of computational biology. It is a forum for the presentation of work in databases, algorithms, interfaces, visualization, modeling, and other computational methods, as applied to biological problems, with emphasis on applications in data-rich areas of molecular biology.The PSB has been designed to be responsive to the need for critical mass in sub-disciplines within biocomputing. For that reason, it is the only meeting whose sessions are defined dynamically each year in response to specific proposals. PSB sessions are organized by leaders of research in biocomputing's 'hot topics.' In this way, the meeting provides an early forum for serious examination of emerging methods and approaches in this rapidly changing field.

Topological Methods in Data Analysis and Visualization - Valerio Pascucci 2010-11-23

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).

Cybersecurity and Applied Mathematics - Leigh Metcalf 2016-06-07

Cybersecurity and Applied Mathematics explores the mathematical concepts necessary for effective cybersecurity research and practice, taking an applied approach for practitioners and students entering the field. This book covers methods of statistical exploratory data analysis and visualization as a type of model for driving decisions, also discussing key topics, such as graph theory, topological complexes, and persistent homology. Defending the Internet is a complex effort, but applying the right techniques from mathematics can make this task more manageable. This book is essential reading for creating useful and replicable methods for analyzing data. Describes mathematical tools for solving cybersecurity problems, enabling analysts to pick the most optimal tool for the task at hand Contains numerous cybersecurity examples and exercises using real world data Written by mathematicians and statisticians with hands-on practitioner experience

Nanoinformatics - Isao Tanaka 2018-01-15

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 great progress in the area in which "big-data" generated by experiments or computations are fully utilized to accelerate discovery of new materials, key factors, and design rules. Data-intensive approaches play indispensable roles in advanced materials characterization. "Materials informatics" is the central paradigm in the new trend. "Nanoinformatics" is its essential subset, which focuses on nanostructures of materials such as surfaces, interfaces, dopants, and point defects, playing a critical role in determining materials properties. There have been significant advances in experimental and computational techniques to characterize individual atoms in nanostructures and to gain quantitative information. The collaboration of researchers in materials science and information science is growing actively and is creating a new trend in materials science and engineering.

Topological Methods in Data Analysis and Visualization III - Peer-Timo Bremer 2014-05-07

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.

Mathematical Problems in Data Science - Li M. Chen 2015-12-15

This book describes current problems in data science and Big Data. Key topics are data classification, Graph Cut, the Laplacian Matrix, Google Page Rank, efficient algorithms, hardness of problems, different types of big data, geometric data structures, topological data processing, and various learning methods. For unsolved problems such as incomplete data relation and reconstruction, the book includes possible solutions and both statistical and computational methods for data analysis. Initial chapters focus on exploring the properties of incomplete data sets and partial-connectedness among data points or data sets. Discussions also cover the completion problem of Netflix matrix; machine learning method on massive data sets; image segmentation and video search. This book introduces software tools for data science and Big Data such as MapReduce, Hadoop, and Spark. This book contains three parts. The first part explores the fundamental tools of data science. It includes basic graph theoretical methods, statistical and AI methods for massive data sets. In second part, chapters focus on the procedural treatment of data science problems including machine learning methods, mathematical image and video processing, topological data analysis, and statistical methods. The final section provides case studies on special topics in variational learning, manifold learning, business and financial data rec overy, geometric search, and computing models. Mathematical Problems in Data Science is a valuable resource for researchers and professionals working in data science, information systems and networks. Advanced-level students studying computer science, electrical engineering and mathematics will also find the content helpful.

Computational Topology - Herbert Edelsbrunner 2010

Combining concepts from topology and algorithms, this book delivers what its title promises: an introduction to the field of computational topology. Starting with motivating problems in both 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. This point of view 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 main approach 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 background of both 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 computer science department.

Computational Topology for Data Analysis - Tamal Krishna Dey 2022

"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"--

Topological Methods in Data Analysis and Visualization V - Hamish Carr 2020-12-10
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.

An Introduction to Data Analysis in R - Alfonso Zamora Saiz 2020-07-27
This textbook offers an easy-to-follow, practical guide to modern data analysis using the programming language R. The chapters cover topics such as the fundamentals of programming in R, data collection and preprocessing, including web scraping, data visualization, and statistical methods, including multivariate analysis, and feature exercises at the end of each section. The text requires only basic statistics skills, as it strikes a balance between statistical and mathematical understanding and implementation in R, with a special emphasis on reproducible examples and real-world applications. This textbook is primarily intended for undergraduate students of mathematics, statistics, physics, economics, finance and business who are pursuing a career in data analytics. It will be equally valuable for master students of data science and industry professionals who want to conduct data analyses.

Applied Spatial Data Analysis with R - Roger S. Bivand 2013-06-21
Applied Spatial Data Analysis with R, second edition, is divided into two basic parts, the first presenting R packages, functions, classes and methods for handling spatial data. This part is of interest to users who need to access and visualise spatial data. Data import and export for many file formats for spatial data are covered in detail, as is the interface between R and the open source GRASS GIS and the handling of spatio-temporal data. The second part showcases more specialised kinds of spatial data analysis, including spatial point pattern analysis, interpolation and geostatistics, areal data analysis and disease mapping. The coverage of methods of spatial data analysis ranges from standard techniques to new developments, and the examples used are largely taken from the spatial statistics literature. All the examples can be run using R contributed packages available from the CRAN website, with code and additional data sets from the book's own website. Compared to the first edition, the second edition covers the more systematic approach towards handling spatial data in R, as well as a number of important and widely used CRAN packages that have appeared since the first edition. This book will be of interest to researchers who intend to use R to handle, visualise, and analyse spatial data. It will also be of interest to spatial data analysts who do not use R, but who are interested in practical aspects of implementing software for spatial data analysis. It is a suitable companion book for introductory spatial statistics courses and for applied methods courses in a wide range of subjects using spatial data, including human and physical geography, geographical information science and geoinformatics, the environmental sciences, ecology, public health and disease control, economics, public administration and political science. The book has a website where complete code examples, data sets, and other support material may be found: http://www.asdar-book.org. The authors have taken part in writing and maintaining software for spatial data handling and analysis with R in concert since 2003.

Handbook of Data Visualization - Chun-houh Chen 2007-12-18
Visualizing the data is an essential part of any data analysis. Modern computing developments have led to big improvements in graphic capabilities and there are many new possibilities for data displays. This book gives an overview of modern data visualization methods, both in theory and practice. It details modern graphical tools such as mosaic plots, parallel coordinate plots, and linked views. Coverage also examines graphical methodology for particular areas of statistics, for example Bayesian analysis, genomic data and cluster analysis, as well software for graphics.

Handbook of Discrete and Computational Geometry - Csaba D. Toth 2017-11-22
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.

Topology for Computing - Afra J. Zomorodian 2005-01-10
The emerging field of computational topology utilizes theory from topology and the power of computing to solve problems in diverse fields. Recent applications include computer graphics, computer-aided design (CAD), and structural biology, all of which involve understanding the intrinsic shape of some real or abstract space. A primary goal of this book is to present basic concepts from topology and Morse theory to enable a non-specialist to grasp and participate in current research in computational topology. The author gives a self-contained presentation of the mathematical concepts from a computer scientist's point of view, combining point set topology, algebraic topology, group theory, differential manifolds, and Morse theory. He also presents some recent advances in the area, including topological persistence and hierarchical Morse complexes. Throughout, the focus is on computational challenges and on presenting algorithms and data structures when appropriate.

Topological Data Analysis for Scientific Visualization - Julien Tierny 2018-01-16
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 - Ronald Peikert 2012-01-10
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.

Advances in Intelligent Networking and Collaborative Systems - Leonard Barolli 2017-08-14
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 pla ying 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 developmen t of adaptive, secure, mobile, and intuitive intelligent systems for collaborative work and learning.

Artificial Intelligence in Medicine - David Riaño 2019-06-19
This book constitutes the refereed proceedings of the 17th Conference on Artificial Intelligence in Medicine, AIME 2019, held in Poznan, Poland, in June 2019. The 22 revised full and 31 short papers presented were carefully reviewed and selected from 134 submissions. The papers are organized in the following topical sections: deep learning; simulation; knowledge representation; probabilistic models; behavior monitoring; clustering, natural language processing, and decision support; feature selection; image processing; general machine learning; and unsupervised learning.

Topological Analysis - Gordon Thomas Whyburn 2015-12-08
Topological analysis consists of those basic theorems of analysis which are essentially topological in character, developed and proved entirely by topological and pseudotopological methods. The objective of this volume is the promotion, encouragement, and stimulation of the interaction between topology and analysis-to the benefit of both. Originally published in 1964. 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.

Interactive Knowledge Discovery and Data Mining in Biomedical Informatics - Andreas Holzinger 2014-06-17
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 = 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./ppThis 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.

Haskell Data Analysis Cookbook - Nishant Shukla 2014-06-25
Step-by-step recipes filled with practical code samples and engaging examples demonstrate Haskell in practice, and then the concepts behind the code. This book shows functional developers and analysts how to leverage their existing knowledge of Haskell specifically for high-quality data analysis. A good understanding of data sets and functional programming is assumed.

Topology-based Methods in Visualization - Helwig Hauser 2007-05-24
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.

Handbook of Graph Drawing and Visualization - Roberto Tamassia 2013-08-19
Get an In-Depth Understanding of Graph Drawing Techniques, Algorithms, Software, and ApplicationsThe Handbook of Graph Drawing and Visualization provides a broad, up-to-date survey of the field of graph drawing. It covers topological and geometric foundations, algorithms, software systems, and visualization applications in business, education, scie

Topological Data Analysis for Genomics and Evolution - Raul Rabadan 2019-12-19
An introduction to geometric and topological methods to analyze large scale biological data; includes statistics and genomic applications.

High Performance Visualization - E. Wes Bethel 2012-10-25
Visualization and analysis tools, techniques, and algorithms have undergone a rapid evolution in recent decades to accommodate explosive growth in data size and complexity and to exploit emerging multi- and many-core computational platforms. High Performance Visualization: Enabling Extreme-Scale Scientific Insight focuses on the subset of scientific visualization concerned with algorithm design, implementation, and optimization for use on today's largest computational platforms. The book collects some of the most seminal work in the field, including algorithms and implementations running at the highest levels of concurrency and used by scientific researchers worldwide. After introducing the fundamental concepts of parallel visualization, the book explores approaches to accelerate visualization and analysis operations on high performance computing platforms. Looking to the future and anticipating changes to computational platforms in the transition from the petascale to exascale regime, it presents the main research challenges and describes several contemporary, high performance visualization implementations. Reflecting major concepts in high performance visualization, this book unifies a large and diverse body of computer science research, development, and practical applications. It describes the state of the art at the intersection of scientific visualization, large data, and high performance computing trends, giving readers the foundation to apply the concepts and carry out future research in this area.

Topological Methods in Data Analysis and Visualization IV - Hamish Carr 2017-06-01
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.

Topological and Statistical Methods for Complex Data - Janine Bennett 2014-11-19
This book contains papers presented at the Workshop on the Analysis of Large-scale, High-Dimensional, and Multi-Variate Data Using Topology and Statistics, held in Le Barp, France, June 2013. It features the work of some of the most prominent and recognized leaders in the field who examine challenges as well as detail solutions to the analysis of extreme scale data. The book presents new methods that leverage the mutual strengths of both topological and statistical techniques to support the management, analysis, and visualization of complex data. It covers both theory and application and provides readers with an overview of important key concepts and the latest research trends. Coverage in the book includes multi-variate and/or high-dimensional analysis techniques, feature-based statistical methods, combinatorial algorithms, scalable statistics algorithms, scalar and vector field topology, and multi-scale representations. In addition, the book details algorithms that are broadly applicable and can be used by application scientists to glean insight from a wide range of complex data sets.

Essential Methods for Planning Practitioners - Laxmi Ramasubramanian 2017-11-17
This book assembles and organizes a selected range of methods and techniques that every planning practitioner should know to be successful in the contemporary global urban landscape. The book is unique because it links different aspects of the planning/policy-making enterprise with the appropriate methods and approaches, thus contextualizing the use of specific methods and techniques within a sociopolitical and ethical framework. This volume familiarizes readers with the diverse range of methods, techniques, and skills that must be applied at different scales in dynamic workplace environments where planning policies and programs

are developed and implemented. This book is an invaluable resource in helping new entrants to the planning discourse and profession set aside their own disciplinary biases and empowering them to use their expert knowledge to address societal concerns.

Mathematical Software -- ICMS 2014 - Hoon Hong 2014-08-01
This book constitutes the proceedings of the 4th International Conference on Mathematical Software, ICMS 2014, held in Seoul, South Korea, in August 2014. The 108 papers included in this volume were carefully reviewed and selected from 150 submissions. The papers are organized in topical sections named: invited; exploration; group; coding; topology; algebraic; geometry; surfaces; reasoning; special; Groebner; triangular; parametric; interfaces and general.

Geometric and Topological Inference - Jean-Daniel Boissonnat 2018-09-27
A rigorous introduction to geometric and topological inference, for anyone interested in a geometric approach to data science.

The Data Science Design Manual - Steven S. Skiena 2017-07-01
This engaging and clearly written textbook/reference provides a must-have introduction to the rapidly emerging interdisciplinary field of data science. It focuses on the principles fundamental to becoming a good data scientist and the key skills needed to build systems for collecting, analyzing, and interpreting data. The Data Science Design Manual is a source of practical insights that highlights what really matters in analyzing data, and provides an intuitive understanding of how these core concepts can be used. The book does not emphasize any particular programming language or suite of data-analysis tools, focusing instead on high-level discussion of important design principles. This easy-to-read text ideally serves the needs of undergraduate and early graduate students embarking on an "Introduction to Data Science" course. It reveals how this discipline sits at the intersection of statistics, computer science, and machine learning, with a distinct heft and character of its own. Practitioners in these and related fields will find this book perfect for self-study as well. Additional learning tools: Contains "War Stories," offering perspectives on how data science applies in the real world Includes "Homework Problems," providing a wide range of exercises and projects for self-study Provides a complete set of lecture slides and online video lectures at www.data-manual.com Provides "Take-Home Lessons," emphasizing the big-picture concepts to learn from each chapter Recommends exciting "Kaggle Challenges" from the online platform Kaggle Highlights "False Starts," revealing the subtle reasons why certain approaches fail Offers examples taken from the data science television show "The Quant Shop" (www.quant-shop.com)