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Advances in Applied and Computational Topology

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Afra Zomorodian
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Advances In Applied And Computational Topology Proceedings Of Symposia In Applied Mathematics

Wolfgang Guggemos



Advances In Applied And Computational Topology Proceedings Of Symposia In Applied Mathematics:

Advances in Applied and Computational Topology American Mathematical Society. Short Course on Computational Topology, 2012-07-05 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 *Computational Geometry, Topology and Physics of Digital Images with Applications* James F. Peters, 2019-10-03 This book discusses the computational geometry topology and physics of digital images and video frame sequences This trio of computational approaches encompasses the study of shape complexes optical vortex nerves and proximities embedded in triangulated video frames and single images while computational geometry focuses on the geometric structures that infuse triangulated visual scenes The book first addresses the topology of cellular complexes to provide a basis for an introductory study of the computational topology of visual scenes exploring the fabric shapes and structures typically found in visual scenes The book then examines the inherent geometry and topology of visual scenes and the fine structure of light and light caustics of visual scenes which bring into play catastrophe theory and the appearance of light caustic folds and cusps Following on from this the book introduces optical vortex nerves in triangulated digital images In this context computational physics is synonymous with the study of the fine structure of light choreographed in video frames This choreography appears as a sequence of snapshots of light reflected and refracted from surface shapes providing a solid foundation for detecting analyzing and classifying visual scene shapes *Sampling Theory, a Renaissance* Götz E. Pfander, 2015-12-08 Reconstructing or approximating objects from seemingly incomplete information is a frequent challenge in mathematics science and engineering A multitude of tools designed to recover hidden information are based on Shannon's classical sampling theorem a central pillar of Sampling Theory The growing need to efficiently obtain precise and tailored digital representations of complex objects and phenomena requires the maturation of available tools in Sampling Theory as well as the development of complementary novel mathematical theories Today research themes such as

Compressed Sensing and Frame Theory re energize the broad area of Sampling Theory This volume illustrates the renaissance that the area of Sampling Theory is currently experiencing It touches upon trendsetting areas such as Compressed Sensing Finite Frames Parametric Partial Differential Equations Quantization Finite Rate of Innovation System Theory as well as sampling in Geometry and Algebraic Topology Topological Signal Processing Michael

Robinson,2014-01-07 Signal processing is the discipline of extracting information from collections of measurements To be effective the measurements must be organized and then filtered detected or transformed to expose the desired information Distortions caused by uncertainty noise and clutter degrade the performance of practical signal processing systems In aggressively uncertain situations the full truth about an underlying signal cannot be known This book develops the theory and practice of signal processing systems for these situations that extract useful qualitative information using the mathematics of topology the study of spaces under continuous transformations Since the collection of continuous transformations is large and varied tools which are topologically motivated are automatically insensitive to substantial distortion The target audience comprises practitioners as well as researchers but the book may also be beneficial for graduate students Self-Aware Computing Systems Samuel Kounev,Jeffrey O. Kephart,Aleksandar Milenkoski,Xiaoyun

Zhu,2017-01-23 This book provides formal and informal definitions and taxonomies for self aware computing systems and explains how self aware computing relates to many existing subfields of computer science especially software engineering It describes architectures and algorithms for self aware systems as well as the benefits and pitfalls of self awareness and reviews much of the latest relevant research across a wide array of disciplines including open research challenges The chapters of this book are organized into five parts Introduction System Architectures Methods and Algorithms Applications and Case Studies and Outlook Part I offers an introduction that defines self aware computing systems from multiple perspectives and establishes a formal definition a taxonomy and a set of reference scenarios that help to unify the remaining chapters Next Part II explores architectures for self aware computing systems such as generic concepts and notations that allow a wide range of self aware system architectures to be described and compared with both isolated and interacting systems It also reviews the current state of reference architectures architectural frameworks and languages for self aware systems Part III focuses on methods and algorithms for self aware computing systems by addressing issues pertaining to system design like modeling synthesis and verification It also examines topics such as adaptation benchmarks and metrics Part IV then presents applications and case studies in various domains including cloud computing data centers cyber physical systems and the degree to which self aware computing approaches have been adopted within those domains Lastly Part V surveys open challenges and future research directions for self aware computing systems It can be used as a handbook for professionals and researchers working in areas related to self aware computing and can also serve as an advanced textbook for lecturers and postgraduate students studying subjects like advanced software engineering autonomic computing self

adaptive systems and data center resource management Each chapter is largely self contained and offers plenty of references for anyone wishing to pursue the topic more deeply

Algorithmic Foundations of Robotics XII Ken Goldberg, Pieter Abbeel, Kostas Bekris, Lauren Miller, 2020-05-06 This book presents the outcomes of the 12th International Workshop on the Algorithmic Foundations of Robotics WAFR 2016 WAFR is a prestigious single track biennial international meeting devoted to recent advances in algorithmic problems in robotics Robot algorithms are an important building block of robotic systems and are used to process inputs from users and sensors perceive and build models of the environment plan low level motions and high level tasks control robotic actuators and coordinate actions across multiple systems However developing and analyzing these algorithms raises complex challenges both theoretical and practical Advances in the algorithmic foundations of robotics have applications to manufacturing medicine distributed robotics human robot interaction intelligent prosthetics computer animation computational biology and many other areas The 2016 edition of WAFR went back to its roots and was held in San Francisco California the city where the very first WAFR was held in 1994 Organized by Pieter Abbeel Kostas Bekris Ken Goldberg and Lauren Miller WAFR 2016 featured keynote talks by John Canny on A Guided Tour of Computer Vision Robotics Algebra and HCI Erik Demaine on Replicators Transformers and Robot Swarms Science Fiction through Geometric Algorithms Dan Halperin on From Piano Movers to Piano Printers Computing and Using Minkowski Sums and by Lydia Kavraki on 20 Years of Sampling Robot Motion Furthermore it included an Open Problems Session organized by Ron Alterovitz Florian Pokorny and Jur van den Berg There were 58 paper presentations during the three day event The organizers would like to thank the authors for their work and contributions the reviewers for ensuring the high quality of the meeting the WAFR Steering Committee led by Nancy Amato as well as WAFR's fiscal sponsor the International Federation of Robotics Research IFRR led by Oussama Khatib and Henrik Christensen WAFR 2016 was an enjoyable and memorable event

Mathematical Reviews, 2004 **Source Publications for SciSearch**, 1989 Mathematical and Computational Methods for Complex Social Systems Heather Z. Brooks, Michelle Feng, Mason A. Porter, Alexandria Volkening, 2025-04-17

The spread of memes and misinformation on social media political redistricting gentrification in urban communities pedestrian movement in crowds and the dynamics of voters are among the many social phenomena that researchers investigate in the field of complex systems In the study of complex social systems there is often also societal relevance to improving our understanding of how individuals interact with each other and their environment giving rise to collective group dynamics The mathematical and computational study of complex social systems relies on and motivates the development of methods in many topics including mathematical modeling data analysis network science and topology and geometry This volume is a collection of diverse articles about complex social systems This collection includes both 1 survey and tutorial articles that introduce complex social systems and methods to study them and 2 manuscripts with original research that highlight a variety of mathematical areas and applications This book introduces the study of complex social

systems to a broad mathematical audience It will particularly appeal to people who are interested in applied mathematics

Advances in Engineering Materials, Structures and Systems: Innovations, Mechanics and Applications Alphose

Zingoni, 2019-08-21 Advances in Engineering Materials Structures and Systems Innovations Mechanics and Applications comprises 411 papers that were presented at SEMC 2019 the Seventh International Conference on Structural Engineering Mechanics and Computation held in Cape Town South Africa from 2 to 4 September 2019 The subject matter reflects the broad scope of SEMC conferences and covers a wide variety of engineering materials both traditional and innovative and many types of structures The many topics featured in these Proceedings can be classified into six broad categories that deal with i the mechanics of materials and fluids elasticity plasticity flow through porous media fluid dynamics fracture fatigue damage delamination corrosion bond creep shrinkage etc ii the mechanics of structures and systems structural dynamics vibration seismic response soil structure interaction fluid structure interaction response to blast and impact response to fire structural stability buckling collapse behaviour iii the numerical modelling and experimental testing of materials and structures numerical methods simulation techniques multi scale modelling computational modelling laboratory testing field testing experimental measurements iv innovations and special structures nanostructures adaptive structures smart structures composite structures bio inspired structures shell structures membranes space structures lightweight structures long span structures tall buildings wind turbines etc v design in traditional engineering materials steel concrete steel concrete composite aluminium masonry timber glass vi the process of structural engineering conceptualisation planning analysis design optimization construction assembly manufacture testing maintenance monitoring assessment repair strengthening retrofitting decommissioning The SEMC 2019 Proceedings will be of interest to civil structural mechanical marine and aerospace engineers Researchers developers practitioners and academics in these disciplines will find them useful Two versions of the papers are available Short versions intended to be concise but self contained summaries of the full papers are in this printed book The full versions of the papers are in the e book

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