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Dictionary of Computer Vision and Image Processing - Robert B. Fisher 2013-11-08
Written by leading researchers, the 2nd Edition of the Dictionary of Computer Vision & Image Processing is a comprehensive and reliable resource which now provides explanations of over 3500 of the most commonly used terms across image processing, computer vision and related fields including machine vision. It offers clear and concise definitions with short examples

or mathematical precision where necessary for clarity that ultimately makes it a very usable reference for new entrants to these fields at senior undergraduate and graduate level, through to early career researchers to help build up knowledge of key concepts. As the book is a useful source for recent terminology and concepts, experienced professionals will also find it a valuable resource for keeping up to date with the latest advances. New features of the 2nd Edition: Contains more than 1000 new terms, notably an increased focus on image processing and machine vision terms; Includes the addition of reference links across the majority of terms pointing readers to further information about the concept under discussion so that they can continue to expand their understanding; Now available as an eBook with enhanced content: approximately 50 videos to further illustrate specific terms; active cross-linking between terms so that readers can easily navigate from one related term to another and build up a full picture of the topic in question; and hyperlinked references to fully embed the text in the current literature.

50 years of Statistical Physics in Mexico: Development, State of the Art and Perspectives - Ramon Castañeda-Priego 2021-09-13

Adventures in Mathematical Physics - International Conference on Transport and Spectral Problems in Quantum Mechanics 2007

This volume consists of refereed research articles written by some of the speakers at this international conference in honor of the sixty-fifth birthday of Jean-Michel Combes. The topics span modern mathematical physics with contributions on state-of-the-art results in the theory of random operators, including localization for random Schrodinger operators with general probability measures, random magnetic Schrodinger operators, and interacting multiparticle operators with

random potentials; transport properties of Schrodinger operators and classical Hamiltonian systems; equilibrium and nonequilibrium properties of open quantum systems; semiclassical methods for multiparticle systems and long-time evolution of wave packets; modeling of nanostructures; properties of eigenfunctions for first-order systems and solutions to the Ginzburg-Landau system; effective Hamiltonians for quantum resonances; quantum graphs, including scattering theory and trace formulas; random matrix theory; and quantum information theory. Graduate students and researchers will benefit from the accessibility of these articles and their current bibliographies.

Algebraic Geometry over the Complex Numbers - Donu Arapura 2012-02-15

This is a relatively fast paced graduate level introduction to complex algebraic geometry, from the basics to the frontier of the subject. It covers sheaf theory, cohomology, some Hodge theory, as well as some of the more algebraic aspects of algebraic geometry. The author frequently refers the reader if the treatment of a certain topic is readily available elsewhere but goes into considerable detail on topics for which his treatment puts a twist or a more transparent viewpoint. His cases of exploration and are chosen very carefully and deliberately. The textbook achieves its purpose of taking new students of complex algebraic geometry through this a deep yet broad introduction to a vast subject, eventually bringing them to the forefront of the topic via a non-intimidating style.

Oseledec Multiplicative Ergodic Theorem for Laminations - Viêt-Anh Nguyên 2017-02-20

Given a -dimensional lamination endowed with a Riemannian metric, the author introduces the notion of a multiplicative cocycle of rank , where and are arbitrary positive integers. The holonomy cocycle of a foliation and its exterior powers as well as its tensor

powers provide examples of multiplicative cocycles. Next, the author defines the Lyapunov exponents of such a cocycle with respect to a harmonic probability measure directed by the lamination. He also proves an Oseledec multiplicative ergodic theorem in this context. This theorem implies the existence of an Oseledec decomposition almost everywhere which is holonomy invariant. Moreover, in the case of differentiable cocycles the author establishes effective integral estimates for the Lyapunov exponents. These results find applications in the geometric and dynamical theory of laminations. They are also applicable to (not necessarily closed) laminations with singularities. Interesting holonomy properties of a generic leaf of a foliation are obtained. The main ingredients of the author's method are the theory of Brownian motion, the analysis of the heat diffusions on Riemannian manifolds, the ergodic theory in discrete dynamics and a geometric study of laminations.

Riemannian Geometry - Isaac Chavel 1995-01-27

This book provides an introduction to Riemannian geometry, the geometry of curved spaces. Its main theme is the effect of the curvature of these spaces on the usual notions of geometry, angles, lengths, areas, and volumes, and those new notions and ideas motivated by curvature itself. Isoperimetric inequalities--the interplay of curvature with volume of sets and the areas of their boundaries--is reviewed along with other specialized classical topics. A number of completely new themes are created by curvature: they include local versus global geometric properties, that is, the interaction of microscopic behavior of the geometry with the macroscopic structure of the space. Also featured is an ambitious "Notes and Exercises" section for each chapter that will develop and enrich the reader's appetite and appreciation for the subject.

Analysis on Graphs and Its Applications - Pavel Exner

2008

This book addresses a new interdisciplinary area emerging on the border between various areas of mathematics, physics, chemistry, nanotechnology, and computer science. The focus here is on problems and techniques related to graphs, quantum graphs, and fractals that parallel those from differential equations, differential geometry, or geometric analysis. Also included are such diverse topics as number theory, geometric group theory, waveguide theory, quantum chaos, quantum wiresystems, carbon nano-structures, metal-insulator transition, computer vision, and communication networks.This volume contains a unique collection of expert reviews on the main directions in analysis on graphs (e.g., on discrete geometric analysis, zeta-functions on graphs, recently emerging connections between the geometric group theory and fractals, quantum graphs, quantum chaos on graphs, modeling waveguide systems and modeling quantum graph systems with waveguides, control theory on graphs), as well as research articles.

Topics in Probability and Lie Groups - John Christopher Taylor

This volume is comprised of two parts: the first contains articles by S. N. Evans, F. Ledrappier, and Figa-Talomanaca. These articles arose from a Centre de Recherches de Mathematiques (CRM) seminar entitiled, ''Topics in Probability on Lie Groups: Boundary Theory''. Evans gives a synthesis of his pre-1992 work on Gaussian measures on vector spaces over a local field. Ledrappier uses the freegroup on d generators as a paradigm for results on the asymptotic properties of random walks and harmonic measures on the Martin boundary. These articles are followed by a case study by Figa-Talamanca using Gelfand pairs to study a diffusion on a compact ultrametric space. The second part of the book is an appendix to the book Compactifications of Symmetric Spaces (Birkhauser) by Y. Guivarc'h and J. C. Taylor. This

appendix consists of an article by each author and presents the contents of this book in a more algebraic way. L. Ji and J.-P. Anker simplifies some of their results on the asymptotics of the Green function that were used to compute Martin boundaries. And Taylor gives a self-contained account of Martin boundary theory for manifolds using the theory of second order strictly elliptic partial differential operators.

Extrinsic Geometric Flows - Bennett Chow 2020-05-14

Extrinsic geometric flows are characterized by a submanifold evolving in an ambient space with velocity determined by its extrinsic curvature. The goal of this book is to give an extensive introduction to a few of the most prominent extrinsic flows, namely, the curve shortening flow, the mean curvature flow, the Gauß curvature flow, the inverse-mean curvature flow, and fully nonlinear flows of mean curvature and inverse-mean curvature type. The authors highlight techniques and behaviors that frequently arise in the study of these (and other) flows. To illustrate the broad applicability of the techniques developed, they also consider general classes of fully nonlinear curvature flows. The book is written at the level of a graduate student who has had a basic course in differential geometry and has some familiarity with partial differential equations. It is intended also to be useful as a reference for specialists. In general, the authors provide detailed proofs, although for some more specialized results they may only present the main ideas; in such cases, they provide references for complete proofs. A brief survey of additional topics, with extensive references, can be found in the notes and commentary at the end of each chapter.

Eigenfunctions of the Laplacian on a Riemannian Manifold - Steve Zelditch 2017-12-12

Eigenfunctions of the Laplacian of a Riemannian manifold can be described in terms of vibrating membranes as well as

quantum energy eigenstates. This book is an introduction to both the local and global analysis of eigenfunctions. The local analysis of eigenfunctions pertains to the behavior of the eigenfunctions on wavelength scale balls. After re-scaling to a unit ball, the eigenfunctions resemble almost-harmonic functions. Global analysis refers to the use of wave equation methods to relate properties of eigenfunctions to properties of the geodesic flow. The emphasis is on the global methods and the use of Fourier integral operator methods to analyze norms and nodal sets of eigenfunctions. A somewhat unusual topic is the analytic continuation of eigenfunctions to Grauert tubes in the real analytic case, and the study of nodal sets in the complex domain. The book, which grew out of lectures given by the author at a CBMS conference in 2011, provides complete proofs of some model results, but more often it gives informal and intuitive explanations of proofs of fairly recent results. It conveys inter-related themes and results and offers an up-to-date comprehensive treatment of this important active area of research.

An Excursion Through Discrete Differential Geometry - American Mathematical Society. Short Course, Discrete Differential Geometry 2020-09-02

Discrete Differential Geometry (DDG) is an emerging discipline at the boundary between mathematics and computer science. It aims to translate concepts from classical differential geometry into a language that is purely finite and discrete, and can hence be used by algorithms to reason about geometric data. In contrast to standard numerical approximation, the central philosophy of DDG is to faithfully and exactly preserve key invariants of geometric objects at the discrete level. This process of translation from smooth to discrete helps to both illuminate the fundamental meaning behind geometric ideas and provide useful algorithmic guarantees. This volume is based on

lectures delivered at the 2018 AMS Short Course ``Discrete Differential Geometry,'' held January 8-9, 2018, in San Diego, California. The papers in this volume illustrate the principles of DDG via several recent topics: discrete nets, discrete differential operators, discrete mappings, discrete conformal geometry, and discrete optimal transport.

Brownian Motion and its Applications to Mathematical Analysis - Krzysztof Burdzy 2014-02-07

These lecture notes provide an introduction to the applications of Brownian motion to analysis and more generally, connections between Brownian motion and analysis. Brownian motion is a well-suited model for a wide range of real random phenomena, from chaotic oscillations of microscopic objects, such as flower pollen in water, to stock market fluctuations. It is also a purely abstract mathematical tool which can be used to prove theorems in "deterministic" fields of mathematics. The notes include a brief review of Brownian motion and a section on probabilistic proofs of classical theorems in analysis. The bulk of the notes are devoted to recent (post-1990) applications of stochastic analysis to Neumann eigenfunctions, Neumann heat kernel and the heat equation in time-dependent domains.

Computational Information Geometry - Frank Nielsen 2016-11-24

This book focuses on the application and development of information geometric methods in the analysis, classification and retrieval of images and signals. It provides introductory chapters to help those new to information geometry and applies the theory to several applications. This area has developed rapidly over recent years, propelled by the major theoretical developments in information geometry, efficient data and image acquisition and the desire to process and interpret large databases of digital information. The book addresses both the transfer of methodology to practitioners involved in database analysis

and in its efficient computational implementation.

Geometric and Spectral Analysis - Pierre Albin 2014-12-01

In 2012, the Centre de Recherches Mathématiques was at the center of many interesting developments in geometric and spectral analysis, with a thematic program on Geometric Analysis and Spectral Theory followed by a thematic year on Moduli Spaces, Extremality and Global Invariants. This volume contains original contributions as well as useful survey articles of recent developments by participants from three of the workshops organized during these programs: Geometry of Eigenvalues and Eigenfunctions, held from June 4-8, 2012; Manifolds of Metrics and Probabilistic Methods in Geometry and Analysis, held from July 2-6, 2012; and Spectral Invariants on Non-compact and Singular Spaces, held from July 23-27, 2012. The topics covered in this volume include Fourier integral operators, eigenfunctions, probability and analysis on singular spaces, complex geometry, Kähler-Einstein metrics, analytic torsion, and Strichartz estimates. This book is co-published with the Centre de Recherches Mathématiques.

Symmetries and Laplacians - David Gurarie 2007-12-21

Designed as an introduction to harmonic analysis and group representations, this book examines concepts, ideas, results, and techniques related to symmetry groups and Laplacians. Its exposition is based largely on examples and applications of general theory, covering a wide range of topics rather than delving deeply into any particular area. Author David Gurarie, a Professor of Mathematics at Case Western Reserve University, focuses on discrete or continuous geometrical objects and structures, such as regular graphs, lattices, and symmetric Riemannian manifolds. Starting with the basics of representation theory, Professor Gurarie discusses commutative harmonic analysis, representations of

compact and finite groups, Lie groups, and the Heisenberg group and semidirect products. Among numerous applications included are integrable hamiltonian systems, geodesic flows on symmetric spaces, and the spectral theory of the Hydrogen atom (Schrodinger operator with Coulomb potential) explicated by its Runge-Lenz symmetry. Three helpful appendixes include supplemental information, and the text concludes with references, a list of frequently used notations, and an index.

Real and Complex Submanifolds - Young Jin Suh 2014-12-05

Edited in collaboration with the Grassmann Research Group, this book contains many important articles delivered at the ICM 2014 Satellite Conference and the 18th International Workshop on Real and Complex Submanifolds, which was held at the National Institute for Mathematical Sciences, Daejeon, Republic of Korea, August 10–12, 2014. The book covers various aspects of differential geometry focused on submanifolds, symmetric spaces, Riemannian and Lorentzian manifolds, and Kähler and Grassmann manifolds.

Ring Theory - 1988-06-01

Ring Theory V1

Encyclopaedia of Mathematics, Supplement III - Michiel Hazewinkel 2007-11-23

This is the third supplementary volume to Kluwer's highly acclaimed twelve-volume Encyclopaedia of Mathematics. This additional volume contains nearly 500 new entries written by experts and covers developments and topics not included in the previous volumes. These entries are arranged alphabetically throughout and a detailed index is included. This supplementary volume enhances the existing twelve volumes, and together, these thirteen volumes represent the most authoritative, comprehensive and up-to-date Encyclopaedia of Mathematics available.

Lorentzian Geometry and Related Topics - María A. Cañadas-Pinedo 2018-03-06

This volume contains a

collection of research papers and useful surveys by experts in the field which provide a representative picture of the current status of this fascinating area. Based on contributions from the VIII International Meeting on Lorentzian Geometry, held at the University of Málaga, Spain, this volume covers topics such as distinguished (maximal, trapped, null, spacelike, constant mean curvature, umbilical...) submanifolds, causal completion of spacetimes, stationary regions and horizons in spacetimes, solitons in semi-Riemannian manifolds, relation between Lorentzian and Finslerian geometries and the oscillator spacetime. In the last decades Lorentzian geometry has experienced a significant impulse, which has transformed it from just a mathematical tool for general relativity to a consolidated branch of differential geometry, interesting in and of itself. Nowadays, this field provides a framework where many different mathematical techniques arise with applications to multiple parts of mathematics and physics. This book is addressed to differential geometers, mathematical physicists and relativists, and graduate students interested in the field.

Families of Conformally Covariant Differential Operators, Q-Curvature and Holography - Andreas Juhl 2009-07-26

This book studies structural properties of Q-curvature from an extrinsic point of view by regarding it as a derived quantity of certain conformally covariant families of differential operators which are associated to hypersurfaces.

On Some Aspects of Oscillation Theory and Geometry - Bruno Bianchini 2013-08-23

The aim of this paper is to analyze some of the relationships between oscillation theory for linear ordinary differential equations on the real line (shortly, ODE) and the geometry of complete Riemannian manifolds. With this motivation the authors prove some new results in both

directions, ranging from oscillation and nonoscillation conditions for ODE's that improve on classical criteria, to estimates in the spectral theory of some geometric differential operator on Riemannian manifolds with related topological and geometric applications. To keep their investigation basically self-contained, the authors also collect some, more or less known, material which often appears in the literature in various forms and for which they give, in some instances, new proofs according to their specific point of view.

Global Analysis on Open Manifolds - Jürgen Eichhorn 2007

Global analysis is the analysis on manifolds. Since the middle of the sixties there exists a highly elaborated setting if the underlying manifold is compact, evidence of which can be found in index theory, spectral geometry, the theory of harmonic maps, many applications to mathematical physics on closed manifolds like gauge theory, Seiberg-Witten theory, etc. If the underlying manifold is open, i.e. non-compact and without boundary, then most of the foundations and of the great achievements fail. Elliptic operators are no longer Fredholm, the analytical and topological indexes are not defined, the spectrum of self-adjoint elliptic operators is no longer discrete, functional spaces strongly depend on the operators involved and the data from geometry, many embedding and module structure theorems do not hold, manifolds of maps are not defined, etc. It is the goal of this new book to provide serious foundations for global analysis on open manifolds, to discuss the difficulties and special features which come from the openness and to establish many results and applications on this basis.

Graphs and Discrete Dirichlet Spaces - Matthias Keller 2021-10-22

The spectral geometry of infinite graphs deals with three major themes and their interplay: the spectral theory of the Laplacian, the geometry of

the underlying graph, and the heat flow with its probabilistic aspects. In this book, all three themes are brought together coherently under the perspective of Dirichlet forms, providing a powerful and unified approach. The book gives a complete account of key topics of infinite graphs, such as essential self-adjointness, Markov uniqueness, spectral estimates, recurrence, and stochastic completeness. A major feature of the book is the use of intrinsic metrics to capture the geometry of graphs. As for manifolds, Dirichlet forms in the graph setting offer a structural understanding of the interaction between spectral theory, geometry and probability. For graphs, however, the presentation is much more accessible and inviting thanks to the discreteness of the underlying space, laying bare the main concepts while preserving the deep insights of the manifold case. Graphs and Discrete Dirichlet Spaces offers a comprehensive treatment of the spectral geometry of graphs, from the very basics to deep and thorough explorations of advanced topics. With modest prerequisites, the book can serve as a basis for a number of topics courses, starting at the undergraduate level.

Analysis and Geometry on Graphs and Manifolds - Matthias Keller 2020-08-20

A contemporary exploration of the interplay between geometry, spectral theory and stochastics which is explored for graphs and manifolds.

Trace Formulas - Steven Lord 2023-04-03

This volume introduces noncommutative integration theory on semifinite von Neumann algebras and the theory of singular traces for symmetric operator spaces. Deeper aspects of the association between measurability, poles and residues of spectral zeta functions, and asymptotics of heat traces are studied. Applications in Connes' noncommutative geometry that are detailed include integration

of quantum differentials, measures on fractals, and Connes' character formula concerning the Hochschild class of the Chern character.

Theory - Steven Lord 2021-07-19

This book is the second edition of the first complete study and monograph dedicated to singular traces. The text offers, due to the contributions of Albrecht Pietsch and Nigel Kalton, a complete theory of traces and their spectral properties on ideals of compact operators on a separable Hilbert space. The second edition has been updated on the fundamental approach provided by Albrecht Pietsch. For mathematical physicists and other users of Connes' noncommutative geometry the text offers a complete reference to traces on weak trace class operators, including Dixmier traces and associated formulas involving residues of spectral zeta functions and asymptotics of partition functions.

Maximum Principles and Geometric Applications - Luis J. Alías 2016-02-13

This monograph presents an introduction to some geometric and analytic aspects of the maximum principle. In doing so, it analyses with great detail the mathematical tools and geometric foundations needed to develop the various new forms that are presented in the first chapters of the book. In particular, a generalization of the Omori-Yau maximum principle to a wide class of differential operators is given, as well as a corresponding weak maximum principle and its equivalent open form and parabolicity as a special stronger formulation of the latter. In the second part, the attention focuses on a wide range of applications, mainly to geometric problems, but also on some analytic (especially PDEs) questions including: the geometry of submanifolds, hypersurfaces in Riemannian and Lorentzian targets, Ricci solitons, Liouville theorems, uniqueness of solutions of Lichnerowicz-type PDEs and so on. Maximum Principles and Geometric Applications is

written in an easy style making it accessible to beginners. The reader is guided with a detailed presentation of some topics of Riemannian geometry that are usually not covered in textbooks. Furthermore, many of the results and even proofs of known results are new and lead to the frontiers of a contemporary and active field of research.

Topics in Modern Differential Geometry - Stefan Haesen 2016-12-21

A variety of introductory articles is provided on a wide range of topics, including variational problems on curves and surfaces with anisotropic curvature. Experts in the fields of Riemannian, Lorentzian and contact geometry present state-of-the-art reviews of their topics. The contributions are written on a graduate level and contain extended bibliographies. The ten chapters are the result of various doctoral courses which were held in 2009 and 2010 at universities in Leuven, Serbia, Romania and Spain.

Local L^p-Brunn-Minkowski Inequalities for $p - Alexander V. Kolesnikov 2022-05-24

View the abstract.

Fractal Geometry and Dynamical Systems in Pure and Applied Mathematics: Fractals in pure mathematics - David Carfi 2013-10-22

This volume contains the proceedings from three conferences: the PISRS 2011 International Conference on Analysis, Fractal Geometry, Dynamical Systems and Economics, held November 8-12, 2011 in Messina, Italy; the AMS Special Session on Fractal Geometry in Pure and Applied Mathematics, in memory of Benoit Mandelbrot, held January 4-7, 2012, in Boston, MA; and the AMS Special Session on Geometry and Analysis on Fractal Spaces, held March 3-4, 2012, in Honolulu, HI. Articles in this volume cover fractal geometry (and some aspects of dynamical systems) in pure mathematics. Also included are articles discussing a variety of connections of fractal geometry with other fields of mathematics, including

probability theory, number theory, geometric measure theory, partial differential equations, global analysis on non-smooth spaces, harmonic analysis and spectral geometry. The companion volume (Contemporary Mathematics, Volume 601) focuses on applications of fractal geometry and dynamical systems to other sciences, including physics, engineering, computer science, economics, and finance.

Information Processing in Medical Imaging - Aasa Feragen 2021-06-20

This book constitutes the proceedings of the 27th International Conference on Information Processing in Medical Imaging, IPMI 2021, which was held online during June 28-30, 2021. The conference was originally planned to take place in Bornholm, Denmark, but changed to a virtual format due to the COVID-19 pandemic. The 59 full papers presented in this volume were carefully reviewed and selected from 200 submissions. They were organized in topical sections as follows: registration; causal models and interpretability; generative modelling; shape; brain connectivity; representation learning; segmentation; sequential modelling; learning with few or low quality labels; uncertainty quantification and generative modelling; and deep learning.

Harmonic Analysis and Applications - Carlos E. Kenig 2020-12-14

The origins of the harmonic analysis go back to an ingenious idea of Fourier that any reasonable function can be represented as an infinite linear combination of sines and cosines. Today's harmonic analysis incorporates the elements of geometric measure theory, number theory, probability, and has countless applications from data analysis to image recognition and from the study of sound and vibrations to the cutting edge of contemporary physics. The present volume is based on lectures presented at the summer school on Harmonic Analysis. These notes give fresh, concise, and high-level

introductions to recent developments in the field, often with new arguments not found elsewhere. The volume will be of use both to graduate students seeking to enter the field and to senior researchers wishing to keep up with current developments.

Geometric and Computational Spectral Theory - Alexandre Girouard 2017-10-30

A co-publication of the AMS and Centre de Recherches Mathématiques The book is a collection of lecture notes and survey papers based on the mini-courses given by leading experts at the 2015 Séminaire de Mathématiques Supérieures on Geometric and Computational Spectral Theory, held from June 15–26, 2015, at the Centre de Recherches Mathématiques, Université de Montréal, Montréal, Quebec, Canada. The volume covers a broad variety of topics in spectral theory, highlighting its connections to differential geometry, mathematical physics and numerical analysis, bringing together the theoretical and computational approaches to spectral theory, and emphasizing the interplay between the two.

Łojasiewicz-Simon Gradient Inequalities for Coupled Yang-Mills Energy Functionals - Paul M Feehan 2021-02-10

The authors' primary goal in this monograph is to prove Łojasiewicz-Simon gradient inequalities for coupled Yang-Mills energy functions using Sobolev spaces that impose minimal regularity requirements on pairs of connections and sections.

Topological Persistence in Geometry and Analysis - Leonid Polterovich 2020-05-11

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 of

persistence to symplectic topology, including the geometry of symplectomorphism groups and embedding problems. Furthermore, they discuss topological function theory, which provides new insight into oscillation of functions. The book is accessible to readers with a basic background in algebraic and differential topology.

Processing, Analyzing and Learning of Images, Shapes, and Forms: - Xue-Cheng Tai 2019-10

Processing, Analyzing and Learning of Images, Shapes, and Forms: Part 2, Volume 20, surveys the contemporary developments relating to the analysis and learning of images, shapes and forms, covering mathematical models and quick computational techniques. Chapter cover Alternating Diffusion: A Geometric Approach for Sensor Fusion, Generating Structured TV-based Priors and Associated Primal-dual Methods, Graph-based Optimization Approaches for Machine Learning, Uncertainty Quantification and Networks, Extrinsic Shape Analysis from Boundary Representations, Efficient Numerical Methods for Gradient Flows and Phase-field Models, Recent Advances in Denoising of Manifold-Valued Images, Optimal Registration of Images, Surfaces and Shapes, and much more. Covers contemporary developments relating to the analysis and learning of images, shapes and forms Presents mathematical models and quick computational techniques relating to the topic Provides broad coverage, with sample chapters presenting content on Alternating Diffusion and Generating Structured TV-based Priors and Associated Primal-dual Methods

Einstein Constraints and Ricci Flow - Mauro Carfora 2023-01-10

This book contains a self-consistent treatment of a geometric averaging technique, induced by the Ricci flow, that allows comparing a given (generalized) Einstein initial data set with another distinct Einstein initial data set, both

supported on a given closed n-dimensional manifold. This is a case study where two vibrant areas of research in geometric analysis, Ricci flow and Einstein constraints theory, interact in a quite remarkable way. The interaction is of great relevance for applications in relativistic cosmology, allowing a mathematically rigorous approach to the initial data set averaging problem, at least when data sets are given on a closed space-like hypersurface. The book does not assume an a priori knowledge of Ricci flow theory, and considerable space is left for introducing the necessary techniques. These introductory parts gently evolve to a detailed discussion of the more advanced results concerning a Fourier-mode expansion and a sophisticated heat kernel representation of the Ricci flow, both of which are of independent interest in Ricci flow theory. This work is intended for advanced students in mathematical physics and researchers alike.

Processing, Analyzing and Learning of Images, Shapes, and Forms: Part 2 - 2019-10-16

Processing, Analyzing and Learning of Images, Shapes, and Forms: Part 2, Volume 20, surveys the contemporary developments relating to the analysis and learning of images, shapes and forms, covering mathematical models and quick computational techniques. Chapter cover Alternating Diffusion: A Geometric Approach for Sensor Fusion, Generating Structured TV-based Priors and Associated Primal-dual Methods, Graph-based Optimization Approaches for Machine Learning, Uncertainty Quantification and Networks, Extrinsic Shape Analysis from Boundary Representations, Efficient Numerical Methods for Gradient Flows and Phase-field Models, Recent Advances in Denoising of Manifold-Valued Images, Optimal Registration of Images, Surfaces and Shapes, and much more. Covers contemporary developments relating to the analysis and learning of images, shapes and forms Presents mathematical models and quick computational

techniques relating to the topic Provides broad coverage, with sample chapters presenting content on Alternating Diffusion and Generating Structured TV-based Priors and Associated Primal-dual Methods

Analysis and Geometry of Markov Diffusion Operators - Dominique Bakry 2013-11-18

The present volume is an extensive monograph on the analytic and geometric aspects of Markov diffusion operators. It focuses on the geometric curvature properties of the underlying structure in order to study convergence to equilibrium, spectral bounds, functional inequalities such as Poincaré, Sobolev or logarithmic Sobolev inequalities, and various bounds on solutions of evolution equations. At the same time, it covers a large class of evolution and partial differential equations. The book is intended to serve as an introduction to the subject and to be accessible for beginning and advanced scientists and non-specialists. Simultaneously, it covers a wide range of results and techniques from the early developments in the mid-eighties to the latest achievements. As such, students and researchers interested in the modern aspects of Markov diffusion operators and semigroups and their connections to analytic functional inequalities, probabilistic convergence to equilibrium and geometric curvature will find it especially useful. Selected chapters can also be used for advanced courses on the topic.

The Spectrum of Hyperbolic Surfaces - Nicolas Bergeron 2016-02-19

This text is an introduction to the spectral theory of the Laplacian on compact or finite area hyperbolic surfaces. For some of these surfaces, called “arithmetic hyperbolic surfaces”, the eigenfunctions are of arithmetic nature, and one may use analytic tools as well as powerful methods in number theory to study them. After an introduction to the hyperbolic geometry of surfaces, with a special emphasis on those of arithmetic

type, and then an introduction to spectral analytic methods on the Laplace operator on these surfaces, the author develops the analogy between geometry (closed geodesics) and arithmetic (prime numbers) in proving the Selberg trace formula. Along with important number theoretic applications, the author exhibits applications of these tools to the spectral statistics of the Laplacian and the quantum unique ergodicity property. The latter refers to the arithmetic quantum unique ergodicity theorem, recently proved by Elon Lindenstrauss. The fruit of several graduate level courses at Orsay and Jussieu, The Spectrum of Hyperbolic Surfaces allows the reader to review an array of classical results and then to be led towards very active areas in modern mathematics.