A Course In Metric Geometry Graduate Studies In Ma

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LUCERO JAMARI

Ricci Flow and Geometric Applications Berlin ; New York : Springer-Verlag
This book provides a valuable glimpse into discrete curvature, a rich new field of research which blends discrete mathematics, differential geometry, probability and computer graphics. It includes a vast collection of ideas and tools which will offer something new to all interested readers. Discrete geometry has arisen as much as a theoretical development as in response to unforeseen challenges coming from applications. Discrete and continuous geometries have turned out to be intimately connected. Discrete curvature is the key concept connecting them through many bridges in numerous fields: metric spaces, Riemannian and Euclidean geometries, geometric measure theory, topology, partial differential equations, calculus of variations, gradient flows, asymptotic analysis, probability, harmonic analysis, graph theory, etc. In spite of its crucial importance both in theoretical mathematics and in applications, up to now, almost no books have provided a coherent outlook on this emerging field.
Geometry and Analysis of Metric Spaces via Weighted Partitions Springer Science & Business Media
Relationalism about space is a venerable doctrine that is enjoying renewed attention among philosophers and physicists. Relationalists deny that space is ontologically prior to matter and seek to ground all claims about the structure of space in facts about actual and possible configurations of matter. Thus, many relationalists maintain that to say that space is infinite is to say that certain sorts of infinite arrays of material points are possible (even if, in fact, the world contains only a finite amount of matter). Gordon Belot investigates the distinctive notion of geometric possibility that relationalists rely upon. He examines the prospects for adapting to the geometric case the standard philosophical accounts of the related notion of physical possibility, with particular emphasis on Humean,

primitivist, and necessitarian accounts of physical and geometric possibility. This contribution to the debate concerning the nature of space will be of interest not only to philosophers and metaphysicians concerned with space and time, but also to those interested in laws of nature, modal notions, or more general issues in ontology.

Lectures on Analysis on Metric Spaces American Mathematical Soc.

This English edition could serve as a text for a first year graduate course on differential geometry, as did for a long time the Chicago Notes of Chern mentioned in the Preface to the German Edition. Suitable references for ordin ary differential equations are Hurewicz, W. Lectures on ordinary differential equations. MIT Press, Cambridge, Mass., 1958, and for the topology of surfaces: Massey, Algebraic Topology, Springer-Verlag, New York, 1977. Upon David Hoffman fell the difficult task of transforming the tightly constructed German text into one which would mesh well with the more relaxed format of the Graduate Texts in Mathematics series. There are some e1aborations and several new figures have been added. I trust that the merits of the German edition have survived whereas at the same time the efforts of David helped to elucidate the general conception of the Course where we tried to put Geometry before Formalism without giving up mathematical rigour. 1 wish to thank David for his work and his enthusiasm during the whole period of our collaboration. At the same time I would like to commend the editors of Springer-Verlag for their patience and good advice. Bonn Wilhelm Klingenberg June,1977 vii From the Preface to the German Edition This book has its origins in a one-semester course in differential geometry which 1 have given many times at Gottingen, Mainz, and Bonn.

Singularities in Geometry and Topology Springer Science & Business Media

From the reviews: "In the world of mathematics, the 1980's might well be described as the "decade of the fractal". Starting with Benoit Mandelbrot's remarkable text The Fractal Geometry of Nature, there has been a deluge of books, articles and television programmes about the beautiful mathematical objects, drawn by computers using recursive or iterative algorithms, which Mandelbrot christened fractals. Gerald Edgar's book is a significant addition to this deluge. Based on a course given to talented high-school students at Ohio University in 1988, it is, in fact, an advanced undergraduate textbook about the mathematics of fractal geometry, treating such topics as metric spaces, measure theory, dimension theory, and even some algebraic topology. However, the book also contains many good illustrations of fractals (including 16 color plates), together with Logo programs which were used to generate them. ... Here then, at last, is an answer to the question on the lips of so many: 'What exactly is a fractal?' I do not expect many of this book's readers to achieve a mature understanding of this answer to the question, but anyone interested in finding out about the mathematics of fractal geometry could not choose a better place to start looking." #Mathematics Teaching#1

Office Hours with a Geometric Group Theorist American Mathematical Soc.

This book offers an introduction to the theory of differentiable manifolds and fiber bundles. It examines bundles from the point of view of metric differential geometry: Euclidean bundles,

Riemannian connections, curvature, and Chern-Weil theory are discussed, including the Pontrjagin, Euler, and Chern characteristic classes of a vector bundle. These concepts are illustrated in detail for bundles over spheres.
Several Complex Variables with Connections to Algebraic Geometry and Lie Groups Elsevier
Central topics covered include curves, surfaces, geodesics, intrinsic geometry, and the Alexandrov global angle comparision theorem Many nontrivial and original problems (some with hints and solutions) Standard theoretical material is combined with more difficult theorems and complex problems, while maintaining a clear distinction between the two levels
Differential Geometry in the Large American Mathematical Soc.
This monograph presents recent developments in comparison geometry and geometric analysis on Finsler manifolds. Generalizing the weighted Ricci curvature into the Finsler setting, the author systematically derives the fundamental geometric and analytic inequalities in the Finsler context. Relying only upon knowledge of differentiable manifolds, this treatment offers an accessible entry point to Finsler geometry for readers new to the area. Divided into three parts, the book begins by establishing the fundamentals of Finsler geometry, including Jacobi fields and curvature tensors, variation formulas for arc length, and some classical comparison theorems. Part II goes on to introduce the weighted Ricci curvature, nonlinear Laplacian, and nonlinear heat flow on Finsler manifolds. These tools allow the derivation of the Bochner–Weitzenböck formula and the corresponding Bochner inequality, gradient estimates, Bakry–Ledoux's Gaussian isoperimetric inequality, and functional inequalities in the Finsler setting. Part III comprises advanced topics: a generalization of the classical Cheeger–Gromoll splitting theorem, the curvature-dimension condition, and the needle decomposition. Throughout, geometric descriptions illuminate the intuition behind the results, while exercises provide opportunities for active engagement. Comparison Finsler Geometry offers an ideal gateway to the study of Finsler manifolds for graduate students and researchers. Knowledge of differentiable manifold theory is assumed, along with the fundamentals of functional analysis. Familiarity with Riemannian geometry is not required, though readers with a background in the area will find their insights are readily transferrable.
Topology of Metric Spaces Cambridge University Press
A description of the global properties of simply-connected spaces that are non-positively curved in the sense of A. D. Alexandrov, and the structure of groups which act on such spaces by isometries. The theory of these objects is developed in a manner accessible to anyone familiar with the rudiments of topology and group theory: non-trivial theorems are proved by concatenating elementary geometric arguments, and many examples are given. Part I provides an introduction to the geometry of geodesic spaces, while Part II develops the basic theory of spaces with upper curvature bounds. More specialized topics, such as complexes of groups, are covered in Part III.
Complex and Symplectic Geometry Springer
Geometry: A Metric Approach with Models, imparts a real feeling for Euclidean and non-Euclidean (in

particular, hyperbolic) geometry. Intended as a rigorous first course, the book introduces and develops the various axioms slowly, and then, in a departure from other texts, continually illustrates the major definitions and axioms with two or three models, enabling the reader to picture the idea more clearly. The second edition has been expanded to include a selection of expository exercises. Additionally, the authors have designed software with computational problems to accompany the text. This software may be obtained from George Parker.

Measure, Topology, and Fractal Geometry Springer Science & Business Media

“Metric geometry” is an approach to geometry based on the notion of length on a topological space. This approach experienced a very fast development in the last few decades and penetrated into many other mathematical disciplines, such as group theory, dynamical systems, and partial differential equations. The objective of this graduate textbook is twofold: to give a detailed exposition of basic notions and techniques used in the theory of length spaces, and, more generally, to offer an elementary introduction into a broad variety of geometrical topics related to the notion of distance, including Riemannian and Carnot-Carathéodory metrics, the hyperbolic plane, distance-volume inequalities, asymptotic geometry (large scale, coarse), Gromov hyperbolic spaces, convergence of metric spaces, and Alexandrov spaces (non-positively and non-negatively curved spaces). The authors tend to work with “easy-to-touch” mathematical objects using “easy-to-visualize” methods. The authors set a challenging goal of making the core parts of the book accessible to first-year graduate students. Most new concepts and methods are introduced and illustrated using simplest cases and avoiding technicalities. The book contains many exercises, which form a vital part of the exposition.

Geometric Possibility Springer Science & Business Media

Deformable objects are ubiquitous in the world surrounding us, on all levels from micro to macro. The need to study such shapes and model their behavior arises in a wide spectrum of applications, ranging from medicine to security. In recent years, non-rigid shapes have attracted growing interest, which has led to rapid development of the field, where state-of-the-art results from very different sciences - theoretical and numerical geometry, optimization, linear algebra, graph theory, machine learning and computer graphics, to mention several - are applied to find solutions. This book gives an overview of the current state of science in analysis and synthesis of non-rigid shapes. Everyday examples are used to explain concepts and to illustrate different techniques. The presentation unfolds systematically and numerous figures enrich the engaging exposition. Practice problems follow at the end of each chapter, with detailed solutions to selected problems in the appendix. A gallery of colored images enhances the text. This book will be of interest to graduate students, researchers and professionals in different fields of mathematics, computer science and engineering. It may be used for courses in computer vision, numerical geometry and geometric modeling and computer graphics or for self-study.

Comparison Finsler Geometry American Mathematical Soc.

The 2019 'Australian-German Workshop on Differential Geometry in the Large' represented an extraordinary cross section of topics across differential geometry, geometric analysis and differential topology. The two-week programme featured talks from prominent keynote speakers from across the globe, treating geometric evolution equations, structures on manifolds, non-negative curvature and Alexandrov geometry, and topics in differential topology. A joy to the expert and novice alike, this proceedings volume touches on topics as diverse as Ricci and mean curvature flow, geometric invariant theory, Alexandrov spaces, almost formality, prescribed Ricci curvature, and Kähler and Sasaki geometry.
Vertebrate Gas Exchange American Mathematical Soc.
Presenting some impressive recent achievements in differential geometry and topology, this volume focuses on results obtained using techniques based on Ricci flow. These ideas are at the core of the study of differentiable manifolds. Several very important open problems and conjectures come from this area and the techniques described herein are used to face and solve some of them. The book’s four chapters are based on lectures given by leading researchers in the field of geometric analysis and low-dimensional geometry/topology, respectively offering an introduction to: the differentiable sphere theorem (G. Besson), the geometrization of 3-manifolds (M. Boileau), the singularities of 3-dimensional Ricci flows (C. Sinestrari), and Kähler–Ricci flow (G. Tian). The lectures will be particularly valuable to young researchers interested in differential manifolds.
Numerical Geometry of Non-Rigid Shapes Springer Nature

This text presents an integrated development of the theory of several complex variables and complex algebraic geometry, leading to proofs of Serre's celebrated GAGA theorems relating the two subjects, and including applications to the representation theory of complex semisimple Lie groups. It includes a thorough treatment of the local theory using the tools of commutative algebra, an extensive development of sheaf theory and the theory of coherent analytic and algebraic sheaves, proofs of the main vanishing theorems for these categories of sheaves, and a complete proof of the finite dimensionality of the cohomology of coherent sheaves on compact varieties. The vanishing theorems have a wide variety of applications and these are covered in detail. Of particular interest are the last three chapters, which are devoted to applications of the preceding material to the study of the structure and representations of complex semisimple Lie groups.Included in this text are introductions to harmonic analysis, the Peter-Weyl theorem, Lie theory and the structure of Lie algebras, semisimple Lie algebras and their representations, algebraic groups and the structure of complex semisimple Lie groups. All of this culminates in Milicic's proof of the Borel-Weil-Bott theorem, which makes extensive use of the material developed earlier in the text. There are numerous examples and exercises in each chapter. This modern treatment of a classic point of view would be an excellent text for a graduate course on several complex variables, as well as a useful reference for the expert.
Metric Affine Geometry American Mathematical Society
This book is an English translation of the

famous "Green Book" by Lafontaine and Pansu (1979). It has been enriched and expanded with new material to reflect recent progress. Additionally, four appendices, by Gromov on Levy's inequality, by Pansu on "quasiconvex" domains, by Katz on systoles of Riemannian manifolds, and by Semmes overviewing analysis on metric spaces with measures, as well as an extensive bibliography and index round out this unique and beautiful book.

Affine and Metric Geometry Based on Linear Algebra Princeton University Press A Course on the Web Graph provides a comprehensive introduction to state-of-the-art research on the applications of graph theory to real-world networks such as the web graph. It is the first mathematically rigorous textbook discussing both models of the web graph and algorithms for searching the web. After introducing key tools required for the study of web graph mathematics, an overview is given of the most widely studied models for the web graph. A discussion of popular web search algorithms, e.g. PageRank, is followed by additional topics, such as applications of infinite graph theory to the web graph, spectral properties of power law graphs, domination in the web graph, and the spread of viruses in networks. The book is based on a graduate course taught at the AARMS 2006 Summer School at Dalhousie University. As such it is self-contained and includes over 100 exercises. The reader of the book will gain a working knowledge of current research in graph theory and its modern applications. In addition, the reader will learn first-hand about models of the web, and the mathematics underlying modern search engines.

A Course in Metric Geometry Springer The aim of these lecture notes is to propose a systematic framework for geometry and analysis on metric spaces. The central notion is a partition (an iterated decomposition) of a compact metric space. Via a partition, a compact metric space is associated with an infinite graph whose boundary is the original space. Metrics and measures on the space are then studied from an integrated point of view as weights of the partition. In the course of the text: It is shown that a weight corresponds to a metric if and only if the associated weighted graph is Gromov hyperbolic. Various relations between metrics and measures such as bilipschitz equivalence, quasisymmetry, Ahlfors regularity, and the volume doubling property are translated to relations between weights. In particular, it is shown that the volume doubling property between a metric and a measure corresponds to a quasisymmetry between two metrics in the language of weights. The Ahlfors regular conformal dimension of a compact metric space is characterized as the critical index of p-energies associated with the partition and the weight function corresponding to the metric. These notes should interest researchers and PhD students working in conformal geometry, analysis on metric spaces, and related areas.

Lectures on Nonsmooth Differential Geometry Alpha Science Int'l Ltd. Analysis on metric spaces emerged in the 1990s as an independent research field providing a unified treatment of first-order analysis in diverse and potentially nonsmooth settings. Based on the fundamental concept of upper gradient, the notion of a Sobolev function was formulated in the setting of metric measure spaces supporting a Poincaré inequality. This coherent

treatment from first principles is an ideal introduction to the subject for graduate students and a useful reference for experts. It presents the foundations of the theory of such first-order Sobolev spaces, then explores geometric implications of the critical Poincaré inequality, and indicates numerous examples of spaces satisfying this axiom. A distinguishing feature of the book is its focus on vector-valued Sobolev spaces. The final chapters include proofs of several landmark theorems, including Cheeger's stability theorem for Poincaré inequalities under Gromov–Hausdorff convergence, and the Keith–Zhong self-improvement theorem for Poincaré inequalities.

Metric and Differential Geometry Springer Science & Business Media

Riemannian manifolds, particularly those with positive or nonnegative curvature, are constructed from only a handful by means of metric fibrations or deformations thereof. This text documents some of these constructions, many of which have only appeared in journal form. The emphasis is less on the fibration itself and more on how to use it to either construct or understand a metric with curvature of fixed sign on a given space.

Differential Geometry, Lie Groups, and Symmetric Spaces Springer Science & Business Media

Geometric group theory is the study of the interplay between groups and the spaces they act on, and has its roots in the works of Henri Poincaré, Felix Klein, J.H.C. Whitehead, and Max Dehn. Office Hours with a Geometric Group Theorist brings together leading experts who provide one-on-one instruction on key topics in this exciting and relatively new field of mathematics. It's like having office hours with your most trusted math professors. An essential primer for undergraduates making the leap to graduate work, the book begins with free groups—actions of free groups on trees, algorithmic questions about free groups, the ping-pong lemma, and automorphisms of free groups. It goes on to cover several large-scale geometric invariants of groups, including quasi-isometry groups, Dehn functions, Gromov hyperbolicity, and asymptotic dimension. It also delves into important examples of groups, such as Coxeter groups, Thompson's groups, right-angled Artin groups, lamplighter groups, mapping class groups, and braid groups. The tone is conversational throughout, and the instruction is driven by examples. Accessible to students who have taken a first course in abstract algebra, Office Hours with a Geometric Group Theorist also features numerous exercises and in-depth projects designed to engage readers and provide jumping-off points for research projects.