

Sobolev met Poincaré

Piotr Hajlasz and Pekka Koskela

Sobolev Met Poincarbe

**Juha Heinonen, Tero Kipelainen, Olli
Martio**



Sobolev Met Poincarbe:

Sobolev Met Poincare Piotr Hajlasz, Pekka Koskela, 2000 There are several generalizations of the classical theory of Sobolev spaces as they are necessary for the applications to Carnot Caratheodory spaces subelliptic equations quasiconformal mappings on Carnot groups and more general Loewner spaces analysis on topological manifolds potential theory on infinite graphs analysis on fractals and the theory of Dirichlet forms The aim of this paper is to present a unified approach to the theory of Sobolev spaces that covers applications to many of those areas The variety of different areas of applications forces a very general setting We are given a metric space X equipped with a doubling measure μ A generalization of a Sobolev function and its gradient is a pair u in $L^1_{\text{loc}} X$ $0 \leq g$ in $L^p X$ such that for every ball B subset X the Poincare type inequality $\int_B u - \int_B u \leq C r \int_B g^p d\mu$ holds where r is the radius of B and $\sigma \geq 1$ $C > 0$ are fixed constants Working in the above setting we show that basically all relevant results from the classical theory have their counterparts in our general setting These include Sobolev Poincare type embeddings Rellich Kondrachov compact embedding theorem and even a version of the Sobolev embedding theorem on spheres The second part of the paper is devoted to examples and applications in the above mentioned areas

Sobolev Met Poincaré Piotr Hajlasz, Pekka Koskela, 1998

Sobolev Spaces in Mathematics I Vladimir Maz'ya, 2008-12-02 This volume marks the centenary of the birth of the outstanding mathematician of the 20th century Sergey Sobolev It includes new results on the latest topics of the theory of Sobolev spaces partial differential equations analysis and mathematical physics

Sobolev Spaces Vladimir Maz'ya, 2011-02-11 Sobolev spaces play an outstanding role in modern analysis in particular in the theory of partial differential equations and its applications in mathematical physics They form an indispensable tool in approximation theory spectral theory differential geometry etc The theory of these spaces is of interest in itself being a beautiful domain of mathematics The present volume includes basics on Sobolev spaces approximation and extension theorems embedding and compactness theorems their relations with isoperimetric and isocapacitary inequalities capacities with applications to spectral theory of elliptic differential operators as well as pointwise inequalities for derivatives The selection of topics is mainly influenced by the author's involvement in their study a considerable part of the text is a report on his work in the field Part of this volume first appeared in German as three booklets of Teubner Texte zur Mathematik 1979 1980 In the Springer volume Sobolev Spaces published in English in 1985 the material was expanded and revised The present 2nd edition is enhanced by many recent results and it includes new applications to linear and nonlinear partial differential equations New historical comments five new chapters and a significantly augmented list of references aim to create a broader and modern view of the area

Lectures on Analysis on Metric Spaces Juha Heinonen, 2012-12-06 Analysis in spaces with no a priori smooth structure has progressed to include concepts from the first order calculus In particular there have been important advances in understanding the infinitesimal versus global behavior of Lipschitz functions and quasiconformal mappings in

rather general settings abstract Sobolev space theories have been instrumental in this development The purpose of this book is to communicate some of the recent work in the area while preparing the reader to study more substantial related articles The material can be roughly divided into three different types classical standard but sometimes with a new twist and recent The author first studies basic covering theorems and their applications to analysis in metric measure spaces This is followed by a discussion on Sobolev spaces emphasizing principles that are valid in larger contexts The last few sections of the book present a basic theory of quasisymmetric maps between metric spaces Much of the material is relatively recent and appears for the first time in book format There are plenty of exercises The book is well suited for self study or as a text in a graduate course or seminar The material is relevant to anyone who is interested in analysis and geometry in nonsmooth settings

Harmonic Analysis, Partial Differential Equations and Applications Sagun Chanillo, Bruno Franchi, Guozhen Lu, Carlos Perez, Eric T. Sawyer, 2017-02-20 This collection of articles and surveys is devoted to Harmonic Analysis related Partial Differential Equations and Applications and in particular to the fields of research to which Richard L Wheeden made profound contributions The papers deal with Weighted Norm inequalities for classical operators like Singular integrals fractional integrals and maximal functions that arise in Harmonic Analysis Other papers deal with applications of Harmonic Analysis to Degenerate Elliptic equations variational problems Several Complex variables Potential theory free boundaries and boundary behavior of functions

Aspects of Sobolev-Type Inequalities L. Saloff-Coste, 2002 Focusing on Poincaré Nash and other Sobolev type inequalities and their applications to the Laplace and heat diffusion equations on Riemannian manifolds this text is an advanced graduate book that will also suit researchers

Nonlinear Potential Theory on Metric Spaces Anders Björn, Jana Björn, 2011 The p -Laplace equation is the main prototype for nonlinear elliptic problems and forms a basis for various applications such as injection moulding of plastics nonlinear elasticity theory and image processing Its solutions called p -harmonic functions have been studied in various contexts since the 1960s first on Euclidean spaces and later on Riemannian manifolds graphs and Heisenberg groups Nonlinear potential theory of p -harmonic functions on metric spaces has been developing since the 1990s and generalizes and unites these earlier theories This monograph gives a unified treatment of the subject and covers most of the available results in the field so far scattered over a large number of research papers The aim is to serve both as an introduction to the area for interested readers and as a reference text for active researchers The presentation is rather self contained but it is assumed that readers know measure theory and functional analysis The first half of the book deals with Sobolev type spaces so called Newtonian spaces based on upper gradients on general metric spaces In the second half these spaces are used to study p -harmonic functions on metric spaces and a nonlinear potential theory is developed under some additional but natural assumptions on the underlying metric space Each chapter contains historical notes with relevant references and an extensive index is provided at the end of the book

Nonlinear Potential Theory of Degenerate Elliptic Equations Juha Heinonen, Tero Kipelaäinen, Olli Martio, 2018-05-16 A self

contained treatment appropriate for advanced undergraduates and graduate students this text offers a detailed development of the necessary background for its survey of the nonlinear potential theory of superharmonic functions 1993 edition

Analysis and Geometry of Markov Diffusion Operators Dominique Bakry,Ivan Gentil,Michel Ledoux,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

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