Local Theory Of Banach Spaces Nyu Courant | 2c6de08f50dca8c165782c47f63facb

The Volume of Convex Bodies and Banach Space Geometry

Weak cotype and weak type in the local theory of Banach spaces

This book is dedicated to the spectral theory of linear operators on Banach spaces and of elements in Banach algebras. It presents a survey of results concerning various types of spectra, both of single and n-tuples of elements. Typical examples are the one-sided spectra, the approximate point, essential, local and Taylor spectrum, and their variants. Many results appear here for the first time in a monograph.

Geometric Aspects of Functional Analysis

This monograph concerns the relationship between the local spectral theory and Fredholm theory of bounded linear operators acting on Banach spaces. The purpose of this book is to provide a first general treatment of the theory of operators for which Weyl-type or Browder-type theorems hold. The product of intensive research carried out over the last ten years, this book explores for the first time in a monograph form, results that were only previously available in journal papers. Written in a simple style, with sections and chapters following an easy, natural flow, it will be an invaluable resource for researchers in Operator Theory and Functional Analysis. The reader is assumed to be familiar with the basic notions of linear algebra, functional analysis and complex analysis.

Geometry and Martingales in Banach Spaces

This book deals with the geometrical structure of finite dimensional normed spaces, as the dimension grows to infinity. This is a part of what came to be known as the Local Theory of Banach Spaces (this name was derived from the fact that in its first stages, this theory dealt mainly with relating the structure of infinite dimensional Banach spaces to the structure of their lattice of finite dimensional subspaces). Our purpose in this book is to introduce the reader to some of the results, problems, and mainly methods developed in the Local Theory, in the last few years. This by no means is a complete survey of this wide area. Some of the main topics we do not discuss here are mentioned in the Notes and Remarks section. Several books appeared recently or are going to appear shortly, which cover much of the material not covered in this book. Among these are Pisier’s [Pis6] where factorization theorems related to Grothendieck’s theorem are extensively discussed, and Tomczak-Jaegermann’s [T-JI] where operator ideals and distances between finite dimensional normed spaces are studied in detail. Another related book is Pietch’s [Pie].

Geometric Aspects of Functional Analysis

This is the third published volume of the proceedings of the Israel Seminar on Geometric Aspects of Functional Analysis. The large majority of the papers in this volume are original research papers. There was
last year a strong emphasis on classical finite-dimensional convexity theory and its connection with Banach space theory. In recent years, it has become evident that the notions and results of the local theory of Banach spaces are useful in solving classical questions in convexity theory. The present volume contributes to clarifying this point. In addition this volume contains basic contributions to ergodic theory, invariant subspace theory and qualitative differential geometry.

**Geometric Aspects of Functional Analysis**

Preparing students for further study of both the classical works and current research, this is an accessible text for students who have had a course in real and complex analysis and understand the basic properties of L p spaces. It is sprinkled liberally with examples, historical notes, citations, and original sources, and over 450 exercises provide practice in the use of the results developed in the text through supplementary examples and counterexamples.

**Introduction to Operator Space Theory**

A significant sector of the development of spectral theory outside the classical area of Hilbert space may be found amongst at multipliers defined on a complex commutative Banach algebra A. Although the general theory of multipliers for abstract Banach algebras has been widely investigated by several authors, it is surprising how rarely various aspects of the spectral theory, for instance Fredholm theory and Riesz theory, of these important classes of operators have been studied. This scarce consideration is even more surprising when one observes that the various aspects of spectral theory mentioned above are quite similar to those of a normal operator defined on a complex Hilbert space. In the last ten years the knowledge of the spectral properties of multipliers of Banach algebras has increased considerably, thanks to the researches undertaken by many people working in local spectral theory and Fredholm theory. This research activity recently culminated with the publication of the book of Laursen and Neumann [214], which collects almost every thing that is known about the spectral theory of multipliers.

**Probability in Banach Spaces**

This is an collection of some easily-formulated problems that remain open in the study of the geometry and analysis of Banach spaces. Assuming the reader has a working familiarity with the basic results of Banach space theory, the authors focus on concepts of basic linear geometry, convexity, approximation, optimization, differentiability, renormings, weak compact generating, Schauder bases and biorthogonal systems, fixed points, topology and nonlinear geometry. The main purpose of this work is to help in convincing young researchers in Functional Analysis that the theory of Banach spaces is a fertile field of research, full of interesting open problems. Inside the Banach space area, the text should help expose young researchers to the depth and breadth of the work that remains, and to provide the perspective necessary to choose a direction for further study. Some of the problems are longstanding open problems, some are recent, some are more important and some are only local problems. Some would require new ideas, some may be resolved with only a subtle combination of known facts. Regardless of their origin or longevity, each of these problems documents the need for further research in this area.

**Convexity and Local Theory in the Geometry of Banach Spaces**

A self-contained presentation of results relating the volume of convex bodies and Banach space geometry.

**Handbook of Metric Fixed Point Theory**

**Handbook of the Geometry of Banach Spaces**

This volume contains the proceedings of the International Workshop on Banach Space Theory, held at the Universidad de Los Andes in Merida, Venezuela in January 1992. These refereed papers contain the newest results in Banach space theory, real or complex function spaces, and nonlinear functional analysis. There are several excellent survey papers, including ones on homogeneous Banach spaces and
applications of probability inequalities, in addition to an important research paper on the distortion problem. This volume is notable for the breadth of the mathematics presented.

**St. Petersburg Mathematical Journal**


**An Introduction to Banach Space Theory**

This volume contains a collection of original research papers on recent developments in Banach space theory and related areas by many of the leading research workers in the field. A considerable number of papers are devoted to structure theory of infinite-dimensional Banach spaces. This research ground has experienced a remarkable breakthrough in recent years, which has given new insight into infinite-dimensional geometry (even of Hilbert spaces). Several new results and examples are included in this volume and new research directions are surveyed. Other contributions concern the well established local theory of Banach spaces and its fruitful connection with classical convexity in R^n. The volume also contains several papers on harmonic analysis, probabilistic methods in functional analysis and nonlinear geometry. Research workers and graduate students in Banach space theory, convexity, harmonic analysis and probability will value this book’s utility and insight.

**Local Theory in Function Analysis**

Famed mathematician Alexander Grothendieck, in his Resume, set forth his plan for the study of the finer structure of Banach spaces. He used tensor products as a foundation upon which he built the classes of operators most important to the study of Banach spaces and established the importance of the "local" theory in the study of these operators and the spaces they act upon. When Lintenstrauss and Pelczynski addressed his work at the rebirth of Banach space theory, they shed his Fundamental Inequality in the trappings of operator ideals by shedding the tensorial formulation. The authors of this book, however, feel that there is much of value in Grothendieck's original formulations in the Resume and here endeavor to "expose the Resume" by presenting most of Grothendieck's arguments using the mathematical tools that were available to him at the time.

**Banach Spaces for Analysts**

This book is a modern treatment of a classical area of operator theory. Written in a meticulous and detailed style, with the modern graduate student of analysis in mind, it contains many simplifications of existing literature. It is full of new results, as well as many illuminating examples. Carefully cross referenced throughout, it also includes an extensive list of the relevant literature.

**Geometric Aspects of Functional Analysis**

A self-contained presentation of results relating the volume of convex bodies and Banach space geometry.

**An Introduction to Local Spectral Theory**

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Topics in Banach Space Theory

Fredholm and Local Spectral Theory, with Applications to Multipliers

This book is intended to be used with graduate courses in Banach space theory.

Spectral Theory of Banach Space Operators

Banach spaces provide a framework for linear and nonlinear functional analysis, operator theory, abstract analysis, probability, optimization and other branches of mathematics. This book introduces the reader to linear functional analysis and to related parts of infinite-dimensional Banach space theory. Key Features: - Develops classical theory, including weak topologies, locally convex space, Schauder bases and compact operator theory - Covers Radon-Nikodým property, finite-dimensional spaces and local theory on tensor products - Contains sections on uniform homeomorphisms and non-linear theory, Rosenthal's L1 theorem, fixed points, and more - Includes information about further topics and directions of research and some open problems at the end of each chapter - Provides numerous exercises for practice The text is suitable for graduate courses or for independent study. Prerequisites include basic courses in calculus and linear. Researchers in functional analysis will also benefit for this book as it can serve as a reference book.

Geometric Aspects of Functional Analysis

As in the previous Seminar Notes, the current volume reflects general trends in the study of Geometric Aspects of Functional Analysis, understood in a broad sense. A classical theme in the Local Theory of Banach Spaces which is well represented in this volume is the identification of lower-dimensional structures in high-dimensional objects. More recent applications of high-dimensionality are manifested by contributions in Random Matrix Theory, Concentration of Measure and Empirical Processes. Naturally, the Gaussian measure plays a central role in many of these topics, and is also studied in this volume; in particular, the recent breakthrough proof of the Gaussian Correlation Conjecture is revisited. The interplay of the theory with Harmonic and Spectral Analysis is also well apparent in several contributions. The classical relation to both the primal and dual Brunn-Minkowski theories is also well represented, and related algebraic structures pertaining to valuations and valent functions are discussed. All contributions are original research papers and were subject to the usual refereeing standards.

Banach Space Theory

This is the sixth published volume of the Israel Seminar on Geometric Aspects of Functional Analysis. The previous volumes are 1983-84 published privately by Tel Aviv University 1985-86 Springer Lecture Notes, Vol. 1267 1985-86 Springer Lecture Notes, Vol. 1317 1986-87 Springer Lecture Notes, Vol. 1376 1987-88 Springer Lecture Notes, Vol. 1469 As in the previous vC!lumes the central subject of -this volume is Banach space theory in its various aspects. In view of the spectacular development in infinite-dimensional Banach space theory in recent years (like the solution of the hyperplane problem, the unconditional basic sequence problem and the distortion problem in Hilbert space) it is quite natural that the present volume contains substantially more contributions in this direction than the previous volumes. This volume also contains many important contributions in the "traditional directions" of this seminar such as probabilistic methods in functional analysis, non-linear theory, harmonic analysis and especially the local theory of Banach spaces and its connection to classical convexity theory in IRn. The papers in this volume are original research papers and include an invited survey by Alexander Olevskii of Kolmogorov's work on Fourier analysis (which was presented at a special meeting on the occasion of the 90th birthday of A. N. Kolmogorov). We are very grateful to Mrs. M. Herberg for her generous help in many directions, which made the publication of this volume possible. Joram Lindenstrauss, Vitali Milman 1992-1994 Operator Theory: Advances and Applications, Vol.
Local Theory of Nonlinear Analytic Ordinary Differential Equations

The Handbook presents an overview of most aspects of modern Banach space theory and its applications. The up-to-date surveys, authored by leading research workers in the area, are written to be accessible to a wide audience. In addition to presenting the state of the art of Banach space theory, the surveys discuss the relation of the subject with such areas as harmonic analysis, complex analysis, classical convexity, probability theory, operator theory, combinatorics, logic, geometric measure theory, and partial differential equations. The Handbook begins with a chapter on basic concepts in Banach space theory which contains all the background needed for reading any other chapter in the Handbook. Each of the twenty one articles in this volume after the basic concepts chapter is devoted to one specific direction of Banach space theory or its applications. Each article contains a motivated introduction as well as an exposition of the main results, methods, and open problems in its specific direction. Most have an extensive bibliography. Many articles contain new proofs of known results as well as expositions of proofs which are hard to locate in the literature or are only outlined in the original research papers. As well as being valuable to experienced researchers in Banach space theory, the Handbook should be an outstanding source for inspiration and information to graduate students and beginning researchers. The Handbook will be useful for mathematicians who want to get an idea of the various developments in Banach space theory.

Geometric Aspects of Functional Analysis

Introduction to Banach Spaces and Their Geometry

This is the third published volume of the proceedings of the Israel Seminar on Geometric Aspects of Functional Analysis. The large majority of the papers in this volume are original research papers. There was last year a strong emphasis on classical finite-dimensional convexity theory and its connection with Banach space theory. In recent years, it has become evident that the notions and results of the local theory of Banach spaces are useful in solving classical questions in convexity theory. The present volume contributes to clarifying this point. In addition this volume contains basic contributions to ergodic theory, invariant subspace theory and qualitative differential geometry.

Open Problems in the Geometry and Analysis of Banach Spaces

Continuing the theme of the previous volumes, these seminar notes reflect general trends in the study of Geometric Aspects of Functional Analysis, understood in a broad sense. Two classical topics represented are the Concentration of Measure Phenomenon in the Local Theory of Banach Spaces, which has recently had triumphs in Random Matrix Theory, and the Central Limit Theorem, one of the earliest examples of regularity and order in high dimensions. Central to the text is the study of the Poincaré and log-Sobolev functional inequalities, their reverses, and other inequalities, in which a crucial role is often played by convexity assumptions such as Log-Concavity. The concept and properties of Entropy form an important subject, with Bourgain's slicing problem and its variants drawing much attention. Constructions related to Convexity Theory are proposed and revisited, as well as inequalities that go beyond the Brunn-Minkowski theory. One of the major current research directions addressed is the identification of lower-dimensional structures with remarkable properties in rather arbitrary high-dimensional objects. In addition to functional analytic results, connections to Computer Science and to Differential Geometry are also discussed.

What is 'local Theory of Banach Spaces'?

Application of Harmonic Analysis to Problems in Local Theory of Banach Spaces and Combinatorics

The notion of amenability has its origins in the beginnings of modern measure theory: Does a finitely additive set function exist which is invariant under a certain group action? Since the 1940s, amenability has become an important concept in abstract harmonic analysis (or rather, more generally, in the theory of semitopological semigroups). In 1972, B.E. Johnson showed that the amenability of a locally compact group G can be characterized in terms of the Hochschild cohomology of its group algebra L^1(G): this initiated the theory of amenable Banach algebras. Since then, amenability has penetrated other branches of mathematics, such as von Neumann algebras, operator spaces, and even differential geometry. Lectures on Amenability introduces second year graduate students to this fascinating area of modern mathematics and leads them to a level from where they can go on to read original papers on the subject. Numerous exercises are interspersed in the text.
Lectures on Amenability

This text provides the reader with the necessary technical tools and background to reach the frontiers of research without the introduction of too many extraneous concepts. Detailed and accessible proofs are included, as are a variety of exercises and problems. The two new chapters in this second edition are devoted to two topics of much current interest amongst functional analysts: Greedy approximation with respect to bases in Banach spaces and nonlinear geometry of Banach spaces. This new material is intended to present these two directions of research for their intrinsic importance within Banach space theory, and to motivate graduate students interested in learning more about them. This textbook assumes only a basic knowledge of functional analysis, giving the reader a self-contained overview of the ideas and techniques in the development of modern Banach space theory. Special emphasis is placed on the study of the classical Lebesgue spaces Lp (and their sequence space analogues) and spaces of continuous functions. The authors also stress the use of bases and basic sequences techniques as a tool for understanding the isomorphic structure of Banach spaces. From the reviews of the First Edition: “The authors of the book succeeded admirably in creating a very helpful text, which contains essential topics with optimal proofs, while being reader friendly. It is also written in a lively manner, and its involved mathematical proofs are elucidated and illustrated by motivations, explanations and occasional historical comments. I strongly recommend to every graduate student who wants to get acquainted with this exciting part of functional analysis the instructive and pleasant reading of this book.” — Gilles Godefroy, Mathematical Reviews

The Metric Theory of Tensor Products

Banach spaces provide a framework for linear and nonlinear functional analysis, operator theory, abstract analysis, probability, optimization and other branches of mathematics. This book introduces the reader to linear functional analysis and to related parts of infinite-dimensional Banach space theory. Key Features: - Develops classical theory, including weak topologies, locally convex space, Schauder bases and compact operator theory - Covers Radon-Nikodym property, finite-dimensional spaces and local theory on tensor products - Contains sections on uniform homeomorphisms and non-linear theory, Rosenthal's L1 theorem, fixed points, and more - Includes information about further topics and directions of research and some open problems at the end of each chapter - Provides numerous exercises for practice

The text is suitable for graduate courses or for independent study. Prerequisites include basic courses in calculus and linear. Researchers in functional analysis will also benefit from this book as it can serve as a reference book.

Topics in the Local Theory of Banach Spaces and Nest Algebras

Continuing the theme of the previous volumes, these seminar notes reflect general trends in the study of Geometric Aspects of Functional Analysis, understood in a broad sense. Two classical topics represented are the Concentration of Measure Phenomenon in the Local Theory of Banach Spaces, which has recently had triumphs in Random Matrix Theory, and the Central Limit Theorem, one of the earliest examples of regularity and order in high dimensions. Central to the text is the study of the Poincaré and log-Sobolev functional inequalities, their reverses, and other inequalities, in which a crucial role is often played by convexity assumptions such as Log-Concavity. The concept and properties of Entropy form an important subject, with Bourgain's slicing problem and its variants drawing much attention. Constructions related to Convexity Theory are proposed and revisited, as well as inequalities that go beyond the Brunn–Minkowski theory. One of the major current research directions addressed is the identification of lower-dimensional structures with remarkable properties in rather arbitrary high-dimensional objects. In addition to functional analytic results, connections to Computer Science and to Differential Geometry are also discussed.

Banach Spaces

Isoperimetric, measure concentration and random process techniques appear at the basis of the modern understanding of Probability in Banach spaces. Based on these tools, the book presents a complete treatment of the main aspects of Probability in Banach spaces (integrability and limit theorems for vector valued random variables, boundedness and continuity of random processes) and of some of their links to Geometry of Banach spaces (via the type and cotype properties). Its purpose is to present some of the main aspects of this theory, from the foundations to the most important achievements. The main features of the investigation are the systematic use of isoperimetry and concentration of measure and abstract random process techniques (entropy and majorizing measures). Examples of these probabilistic tools and ideas to classical Banach space theory are further developed.

Asymptotic Theory of Finite Dimensional Normed Spaces

Since the first edition of this well-known text was published in 1982, significant progress has been made in the local theory of Banach Spaces. This second edition has therefore been brought up to date by the
addition of a completely new section devoted to this topic, as well as various other revisions, an expanded bibliography and a new appendix.

Fredholm and Local Spectral Theory II

Continuing the theme of the previous volumes, these seminar notes reflect general trends in the study of Geometric Aspects of Functional Analysis, understood in a broad sense. Two classical topics represented are the Concentration of Measure Phenomenon in the Local Theory of Banach Spaces, which has recently had triumphs in Random Matrix Theory, and the Central Limit Theorem, one of the earliest examples of regularity and order in high dimensions. Central to the text is the study of the Poincaré and log-Sobolev functional inequalities, their reverses, and other inequalities, in which a crucial role is often played by convexity assumptions such as Log-Concavity. The concept and properties of Entropy form an important subject, with Bourgain's slicing problem and its variants drawing much attention. Constructions related to Convexity Theory are proposed and revisited, as well as inequalities that go beyond the Brunn–Minkowski theory. One of the major current research directions addressed is the identification of lower-dimensional structures with remarkable properties in rather arbitrary high-dimensional objects. In addition to functional analytic results, connections to Computer Science and to Differential Geometry are also discussed.

Spectral Theory of Linear Operators and Spectral Systems in Banach Algebras

Geometric Aspects of Functional Analysis

Geometry and Martingales in Banach Spaces provides a compact exposition of the results explaining the interrelations existing between the metric geometry of Banach spaces and the theory of martingales, and general random vectors with values in those Banach spaces. Geometric concepts such as dentability, uniform smoothness, uniform convexity, Beck convexity, etc. turn out to characterize asymptotic behavior of martingales with values in Banach spaces.

The Volume of Convex Bodies and Banach Space Geometry