1. Record Nr. UNINA9910585774303321

Autore	Sousa Ruben (Mathematician)
Titolo	Convolution-like Structures, Differential Operators and Diffusion Processes / / by Rúben Sousa, Manuel Guerra, Semyon Yakubovich
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2022
ISBN	3-031-05296-X
Edizione	[1st ed. 2022.]
Descrizione fisica	1 online resource (269 pages)
Collana	Lecture Notes in Mathematics, , 1617-9692 ; ; 2315
Disciplina	512.86
Soggetti	Probabilities Operator theory Functions, Special Mathematical analysis Probability Theory Operator Theory Special Functions Integral Transforms and Operational Calculus
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Intro -- Preface -- Contents -- List of Symbols -- 1 Introduction -- 1.1 Motivation and Scope -- 1.2 Organization of the Book -- 2 Preliminaries -- 2.1 Continuous-Time Markov Processes -- 2.2 Sturm-Liouville Theory -- 2.2.1 Solutions of the Sturm-Liouville Equation -- 2.2.2 Eigenfunction Expansions -- 2.2.3 Diffusion Semigroups Generated by Sturm-Liouville Operators -- 2.2.4 Remarkable Particular Cases -- 2.3 Generalized Convolutions and Hypergroups -- 2.4 Harmonic Analysis with Respect to the Kingman Convolution -- 3 The Whittaker Convolution -- 3.1 A Special Case: The Kontorovich-Lebedev Convolution -- 3.2 The Product Formula for the Whittaker Function -- 3.3 Whittaker Translation -- 3.4 Index Whittaker Transforms -- 3.5 Whittaker Convolution of Measures -- 3.5.1 Infinitely Divisible Distributions -- 3.5.2 Lévy-Khintchine Type Representation -- 3.6 Lévy Processes with Respect to the Whittaker Convolution -- 3.6.1 Convolution Semigroups -- 3.6.2 Lévy and Gaussian Processes -- 3.6.3

Some Auxiliary Results on the Whittaker Translation -- 3.6.4 Moment Functions -- 3.6.5 Lévy-Type Characterization of the Shiryaev Process -- 3.7 Whittaker Convolution of Functions -- 3.7.1 Mapping Properties in the Spaces Lp(r) -- 3.7.2 The Convolution Banach Algebra L, -- 3.8 Convolution-Type Integral Equations -- 4 Generalized Convolutions for Sturm-Liouville Operators -- 4.1 Known Results and Motivation -- 4.2 Laplace-Type Representation -- 4.3 The Existence Theorem for Sturm-Liouville Product Formulas -- 4.3.1 The Associated Hyperbolic Cauchy Problem -- 4.3.2 The Time-Shifted Product Formula -- 4.3.3 The Product Formula for w as the Limit Case -- 4.4 Sturm-Liouville Transform of Measures -- 4.5 Sturm-Liouville Convolution of Measures -- 4.5.1 Infinite Divisibility and Lévy-Khintchine Type Representation -- 4.5.2 Convolution Semigroups.
4.5.3 Additive and Lévy Processes -- 4.6 Sturm-Liouville Hypergroups -- 4.6.1 The Nondegenerate Case -- 4.6.2 The Degenerate Case: Degenerate Hypergroups of Full Support -- 4.7 Harmonic Analysis on Lp Spaces -- 4.7.1 A Family of L1 Spaces -- 4.7.2 Application to Convolution-Type Integral Equations -- 5 Convolution-Like Structures on Multidimensional Spaces -- 5.1 Convolutions Associated with Conservative Strong Feller Semigroups -- 5.2 Nonexistence of Convolutions: Diffusion Processes on Bounded Domains -- 5.2.1 Special Cases and Numerical Examples -- 5.2.2 Some Auxiliary Results -- 5.2.3 Eigenfunction Expansions, Critical Points and Nonexistence Theorems -- 5.3 Nonexistence of Convolutions: One-Dimensional Diffusions -- 5.4 Families of Convolutions on Riemannian Structures with Cone-Like Metrics -- 5.4.1 The Eigenfunction Expansion of the Laplace-Beltrami Operator -- 5.4.2 Product Formulas and Convolutions -- 5.4.3 Infinitely Divisible Measures and Convolution Semigroups -- 5.4.4 Special Cases -- 5.4.5 Product Formulas and Convolutions Associated with Elliptic Operators on Subsets of R2 -- A Some Open Problems -- References -- Index.

Sommario/riassunto

This book provides an introduction to recent developments in the theory of generalized harmonic analysis and its applications. It is well known that convolutions, differential operators and diffusion processes are interconnected: the ordinary convolution commutes with the Laplacian, and the law of Brownian motion has a convolution semigroup property with respect to the ordinary convolution. Seeking to generalize this useful connection, and also motivated by its probabilistic applications, the book focuses on the following question: given a diffusion process Xt on a metric space E, can we construct a convolution-like operator * on the space of probability measures on E with respect to which the law of Xt has the *-convolution semigroup property? A detailed analysis highlights the connection between the construction of convolution-like structures and disciplines such as stochastic processes, ordinary and partial differential equations, spectral theory,special functions and integral transforms. The book will be valuable for graduate students and researchers interested in the intersections between harmonic analysis, probability theory and differential equations.