

Preface

At the ninth congress of the International Society for Analysis Applications and Computations (ISAAC), ISAAC Group in Pseudo-Differential Operators (IGPDO) and the ISAAC Group in Generalized Functions (IGGF) agreed to continue with the publication of a joint volume, as for the eight ISAAC Congress in Moscow 2013, of selecting papers from their two special sessions. Generalized functions as a general framework for almost all fields in analysis, and pseudo-differential operators as a basis of microlocal analysis in combination with harmonic and complex analysis with many applications, fit well and offer rich synergies for the further development of analysis in general.

Moreover, the participants of both sessions agreed to dedicate this volume to *Professor Michael Oberguggenberger* at Innsbruck university, Austria on his 60th birthday. Professor Oberguggenberger is one of the founder of the algebraic approach to generalized function theory with many contributions to the qualitative analysis of partial differential equations and a leader of the International Association for Generalized Functions based in Vienna. Professor Oberguggenberger is highly appreciated as a scientist and a strong expert on generalized functions, especially Columbeau algebras. He is also very appreciated as a modest and encouraging person who supervised several PhD student to their examination. It is a pleasure for us to dedicate the volume to him.

This joint volume is titled

Pseudo-Differential Operators and Generalized Functions

and consists of invited papers, mainly based on the scientific activities of the groups IGPDO and IGGF at the ninth ISAAC congress in Krakow, Poland, during August 2013. The volume is intended to be an independent sequel to the volumes “Advances in Pseudo-Differential Operators”, “Pseudo-Differential Operators and Related Topics”, “Modern Trends in Pseudo-Differential Operators”, “New Developments in Pseudo-Differential Operators”, “Pseudo-Differential Operators: Complex Analysis and Partial Differential Equations” and “Pseudo-Differential Operators, Generalized Functions and Asymptotics”. These volumes were based on, respectively, the 4th ISAAC congress in Toronto in 2003, conference in Växjö 2004, 5th ISAAC congress in Catania in 2005, 6th ISAAC congress in Ankara in 2007, workshop in Toronto in 2008, 7th ISAAC congress in London in 2009, and 8th ISAAC congress in Moscow ISAAC in 2011.

The volume consists of 19 peer-reviewed contributions representing modern trends in the theory of generalized functions and pseudo-differential operators. Topics include algebras of generalized functions, ultra-distributions, partial differential equations, micro-local analysis, harmonic analysis, global analysis, geometry, quantization, mathematical physics, and time-frequency analysis. Variety of applications especially in the framework of manifolds with singular metrics and general relativity, microlocal analysis and the analysis of equations with singularities will be interested for a wide audience including graduate students and researchers in partial differential equations, mathematical physics, various fields of analysis, stochastic analysis and geometry.

The papers can be sorted roughly into two groups. The first group of papers is related to generalized functions and deals with various problems of equations with singular coefficients and data within algebras of generalized functions where the classical method of regularizations is well established. Moreover in this setting, local analysis is well adapted and analyzed towards Hölder type spaces and in the direction of generalized manifolds and applications in general relativity.

In the second group of papers, various kinds of Fourier analysis are more present, involving micro-local analysis, harmonic analysis, theory of ultra-distributions, time-frequency analysis, etc. For example, Wiener type Tauberian theorems related to generalized integral transforms stochastic equations are adapted to classical distribution theory. Ultradistribution spaces are analyzed in connection with global type operators and wave fronts. Gabor analysis via modulation spaces or Hermite expansions is developed for various Gelfand–Shilov classes. Time-frequency methods are applied on evolution operators and on random MIMO systems.

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