

## PREFACE

Harmonic analysis and generalized integration represent pivotal areas in contemporary mathematical analysis, providing robust frameworks for exploring the properties of functions and operators across varied mathematical landscapes. Originating from the seminal work of Fourier, harmonic analysis has grown into a sophisticated field that investigates the oscillatory behavior of functions, extending its reach into abstract domains such as topological groups, manifolds, and diverse function spaces. Its applications permeate both theoretical and applied mathematics, offering profound insights into complex systems. Concurrently, generalized integration theories, including the Henstock–Kurzweil and Kurzweil–Stieltjes integrals, have expanded the boundaries of classical integration. These methods enable the handling of highly irregular or singular functions, which traditional integrals cannot accommodate, thus enhancing analytical approaches in real analysis, functional analysis, and differential equations.

This special issue highlights the vibrant synergy between harmonic analysis and generalized integration, presenting advancements and foundational contributions that push the boundaries of function spaces, integration techniques, and analytical methods. The included works explore topics such as generalized Fourier transforms, extensions of classical analytical tools, variable exponent spaces, and innovative approximation techniques, showcasing the breadth and richness of these disciplines.

This special issue is based on the talks presented at the 4th International Conference on Mathematical Analysis and Generalized Integration, held virtually in February 2024, which built upon a series of international academic events fostering global collaboration. This series began with the 1st International Video-Conference on Generalized Integration and its Applications in August 2020, followed by the 2nd International Online Seminar in October 2021 and the 3rd Online Seminar on Mathematical Analysis and Generalized Integration in July 2022. These virtual events significantly strengthened academic ties, particularly between the Mexican and Indian mathematical communities, while incorporating valuable contributions from researchers in Brazil, Canada, China, the Czech Republic, Iran, Oman, and Spain.

The articles in this special issue showcase theoretical advancements in harmonic analysis and generalized integration, enhancing the analytical frameworks for addressing complex mathematical problems. Each contribution expands the theoretical landscape, offering fresh perspectives and methodologies that pave the way for future explorations, potentially bridging classical approaches with emerging applications in mathematics and related fields. We express our heartfelt appreciation to all authors and reviewers whose commitment have made this special issue possible. We hope that this volume will

serve as an inspiring and valuable resource for researchers, academics, and students engaged in the dynamic fields of harmonic analysis and generalized integration.

Finally, the editors extend their gratitude to Poincare Publishers for publishing the proceedings of the conference as a special issue (Volume 12, Issue 1) of the Poincare Journal of Analysis & Applications.

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