Editorial

Fractional-Order Integral and Derivative Operators and Their Applications

Hari Mohan Srivastava [1,2,3] (ID)

1 Department of Mathematics and Statistics, University of Victoria, Victoria, BC V8W 3R4, Canada; harimsri@math.uvic.ca

2 Department of Medical Research, China Medical University Hospital, China Medical University, Taichung 40402, Taiwan

3 Department of Mathematics and Informatics, Azerbaijan University, 71 Jeyhun Hajibeyli Street, AZ1007 Baku, Azerbaijan

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The present volume contains the invited, accepted and published submissions (see [1–22]) to a Special Issue of the MDPI's journal, *Mathematics*, on the subject-area of "Fractional-Order Integral and Derivative Operators and Their Applications". Three successful predecessors of this volume happens to be the Special Issue of the MDPI's journal, *Mathematics*, on the subject-areas of "Recent Advances in Fractional Calculus and Its Applications", "Recent Developments in the Theory and Applications of Fractional Calculus" (see, for details, [23]) and "Operators of Fractional Calculus and Their Applications". In fact, encouraged by the noteworthy successes of this series of four Special Issues, as well as of (for example) two other Special Issues of *Axioms*, on the subject-areas of "Mathematical Analysis and Applications" and "Mathematical Analysis and Applications II", *Axioms* has already started the publication of a Topical Collection, entitled "Mathematical Analysis and Applications" (Collection Editor: H. M. Srivastava), with an open submission deadline. The interested reader should refer to and read the book format of several of these Special Issues (Guest Editor: H. M. Srivastava), which are cited below (see [23–26]).

In recent years, various families of fractional-order integral and derivative operators, such as those named after Riemann-Liouville, Weyl, Hadamard, Grunwald-Letnikov, Riesz, Erdelyi-Kober, Liouville-Caputo, and so on, have been found to be remarkably important and fruitful, due mainly to their demonstrated applications in numerous seemingly diverse and widespread areas of the mathematical, physical, chemical, engineering, and statistical sciences. Many of these fractional-order operators provide interesting, potentially useful tools for solving ordinary and partial differential equations, as well as integral, differintegral, and integro-differential equations; fractional-calculus analogues and extensions of each of these equations; and various other problems involving special functions of mathematical physics and applied mathematics, as well as their extensions and generalizations in one or more variables.

In this Special Issue, we invited and welcomed review, expository, and original research articles dealing with the recent advances in the theory of fractional-order integral and derivative operators and their multidisciplinary applications.

The suggested topics of interest for the call of papers for this Special Issue included, but by no means limited to, the following keywords:

- Operators of fractional calculus and their applications;
- Chaos and fractional dynamics;
- Fractional-order ODEs and PDEs;
- Fractional-order differintegral equations;
- Fractional-order integro-differential equations;

- Fractional-order integrals and fractional-order derivatives associated with special functions of mathematical physics and applied mathematics;
- Identities and inequalities involving fractional-order integrals and fractional-order derivatives;
- Dynamical systems based upon fractional calculus.

Here, in this Editorial, we choose first to briefly describe the status of the Special Issue as follows:

Papers included in this volume deal extensively with various theoretical as well applied topics of fractional calculus and its applications of current research interests. Some of the notable contributions in this volume happen to have successfully addressed such topics of fractional calculus and related mathematical analysis as (for example) operational matrix of fractional-order derivatives for solving systems of fractional differential equations via Legendre wavelets, Hermite polynomial approach for solving the SIR model of epidemics, the extremal solution to conformable fractional differential equations involving integral boundary condition, approximate controllability of sub-diffusion equation with impulsive condition, incomplete hypergeometric functions and incomplete Riemann-Liouville fractional integral operators, random coupled Hilfer and Hadamard fractional differential systems in generalized Banach spaces, uniqueness and existence of approximate solution to initial value problem for fractional differential equation of variable order involving the derivative arguments on the half-axis, solvability of a mixed problem for a high-order partial differential equation with fractional derivatives with respect to time, with Laplace operators with spatial variables and nonlocal boundary conditions in Sobolev classes, fractional-calculus connections between Mittag–Leffler functions, impact of fractional calculus on correlation coefficient between available potassium and spectrum data in ground hyperspectral and Landsat 8 image, efficacy of the post-exposure prophylaxis and of the HIV latent reservoir in HIV infection, fractional-order unknown inputs fuzzy observer for Takagi–Sugeno systems with unmeasurable premise variables, stability results for implicit fractional pantograph differential equations via φ-Hilfer fractional derivative with a nonlocal Riemann-Liouville fractional integral condition, and so on. In connection with such works as (for example) [4,18], and indeed also many papers included in the published volumes [23–26], a recent survey-cum-expository review article [27] will be potentially useful in order to motivate further researches and developments involving a wide variety of operators of basic (or q-) calculus and fractional q-calculus and their widespread applications in Geometric Function Theory of Complex Analysis.

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Conflicts of Interest: The author declares no conflict of interest.

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