ICFDA 2027 — Open Invited Track

AI for Fractional Calculus and Fractional Calculus for AI. (Code 56wb6)

Organizers:

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Abstract: This open invited track invites contributions on the bidirectional relationship between artificial intelligence (AI) and fractional calculus. It welcomes papers that use AI to address challenging problems in fractional modeling, analysis, computation, and fractional-order control (FOC), as well as papers that use fractional calculus to develop and analyze AI methods. The track brings together theoretical advances, computational methods, and applications, with particular interest in rigorous analysis and reproducible validation.

Detailed description:

The track aims to bring together researchers in fractional calculus, control, and artificial intelligence to address two complementary research questions: How can AI help solve challenging fractional-order problems, and how can fractional calculus contribute to the development of AI?

Contributions may focus on AI-driven methods for solving and identifying fractional models, estimating fractional orders and memory kernels, and designing fractional-order controllers, as well as applications of fractional operators in neural networks, learning, optimization, and memory-based system representations.

Topics of interest include, but are not limited to:

- AI-assisted numerical solvers, surrogate models, and physics-informed learning for fractional differential equations and inverse problems.
- Data-driven identification of fractional-order systems, including order estimation, memory-kernel learning, and uncertainty quantification.
- Machine learning and reinforcement learning for fractional-order controller design, tuning, adaptation, and implementation.
- Stability, robustness, convergence, and error analysis of learning-based methods for fractional-order systems.
- Fractional derivatives and integrals in neural architectures, loss functions, regularization, and optimization algorithms.
- Fractional-order learning dynamics and memory-aware models for temporal data, signals, and dynamical systems.
- Hybrid approaches combining fractional models, physical knowledge, and AI, with experimental validation and comparative benchmarks.
- Applications in mechatronics, robotics, energy systems, signal and image processing, and biomedical engineering.

Theoretical, methodological, and application-oriented contributions are welcome. The scope is restricted to methods with an explicit mathematical or computational connection between AI and fractional calculus; general AI or fractional-calculus papers without this connection fall outside the track. Contributions are encouraged to assess the advantages, limitations, and performance of the proposed approaches, including comparisons with established methods where appropriate.

Open participation and promotion:

Submissions are open to all authors without limits. The organizers will promote the track through targeted invitations and announcements, taking responsibility for attracting sufficient contributions. Upon approval, the track will be listed on the ICFDA 2027 website with a dedicated submission code.

Track identification code: To be assigned upon approval.

Key dates:

30 November 2026	Open invited paper submission deadline
15 February 2027	Notification of acceptance
30 April 2027	Final paper submission deadline