Special Issue

Symmetry/Asymmetry in Multi-Objective Optimization

Message from the Guest Editor

Multi-objective optimization is a fundamental discipline in operations research, artificial intelligence, and decision-making, dealing with the simultaneous optimization of multiple conflicting objectives. Symmetry and asymmetry play critical roles in shaping problem structures and influencing the efficiency of optimization algorithms. Symmetry in objectives, constraints, or decision variables often simplifies problem formulation, enabling the design of efficient algorithms that exploit regularity. Conversely, asymmetry introduces complexity and realism, better modeling real-world scenarios where objectives, constraints, or interactions are inherently unbalanced.

Symmetry-based approaches are extensively utilized in multi-objective optimization problems to enhance computational efficiency, simplify analysis, and uncover inherent patterns. On the other hand, addressing asymmetry requires adaptive strategies and novel algorithms that cater to heterogeneous or irregular problem features.

This Special Issue aims to explore the interplay of symmetry and asymmetry in multi-objective optimization, focusing on theoretical advancements, algorithmic innovations, and real-world applications.

Guest Editor

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Deadline for manuscript submissions

31 October 2025

Symmetry

an Open Access Journal by MDPI

Impact Factor 2.2
CiteScore 5.3

mdpi.com/si/231613

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Message from the Editor-in-Chief

Symmetry is ultimately the most important concept in natural sciences. It is not surprising then that very basic and fundamental research achievements are related to symmetry. For instance, the Nobel Prize in Physics 1979 (Glashow, Salam, Weinberg) was received for a unified symmetry description of electromagnetic and weak interactions, while the Nobel Prize in Physics 2008 (Nambu, Kobayashi, Maskawa) was received for the discovery of the mechanism of spontaneous breaking of symmetry, including CP symmetry. Our journal is named *Symmetry* and it manifests its fundamental role in nature.

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