Special Issue

Symmetry and Asymmetry in Machine Learning and Data Science

Message from the Guest Editors

The application of machine learning (ML) in robotics and autonomous systems has enabled significant advancements, yet challenges remain in addressing the structural complexities of real-world operational environments. Symmetry and asymmetry—observed in sensor data, system dynamics, or task requirements—represent critical but understudied properties in these fields. For example, symmetry in multi-sensor alignment (e.g., LiDAR-camera calibration) can improve the reliability of perception systems, while asymmetry under environmental conditions (e.g., uneven terrain for unmanned ground vehicles or occlusions in autonomous driving scenarios) necessitates adaptive control frameworks. Current ML methodologies, however, often fail to systematically incorporate these structural properties, which may limit their effectiveness in real-time decision making, energy optimization, and safety-critical interpretability. This Special Issue, "Symmetry and Asymmetry in Machine Learning and Data Science", aligns with the journal's focus on AI and pattern recognition in automation. It seeks to advance methodologies that integrate geometric priors, data-driven learning...

Guest Editors

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About the Journal

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.

Editor-in-Chief

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