Special Issue

Symmetry with Optimization in Real-World Applications

Message from the Guest Editors

Optimization methods are widely used to solve engineering problems. For example, engineering problems can be converted into multi-objective optimization problems, computer models can be solved or identified using optimization methods, and optimization methods can be used to construct deep neural networks. Practical engineering problems are often based on nonlinear data or models. Nonlinear models usually exhibit symmetry, non-convexity, and multiple equivalent solutions. The optimization problem is the rational collocation and organic combination of mathematical knowledge, information, and thinking methods. Generally, simple methods (such as gradient descent) perform very well in practice. Therefore, mining the symmetry relationship and structure in the nonlinear model can help to propose simple and effective optimization methods, and can help to select appropriate optimization methods for specific engineering problems.

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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.

Editor-in-Chief

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