

## Invited Session

# Deterministic Global Optimization: Advances and Challenges

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### Abstract

It is now established that Global Optimization has ubiquitous applications across all branches of engineering, applied sciences, and sciences (e.g., see the textbook by Floudas 2000). As a result, we have experienced significant interest in new theoretical advances, algorithmic and implementation related investigations, and their application to important scientific problems.

In this presentation, we will provide an overview of the research progress in global optimization, and will provide a perspective for future research opportunities. The overview will cover the areas of

- (a) twice continuously differentiable constrained nonlinear optimization,
- (b) mixed-integer nonlinear optimization,
- (c) optimization with differential-algebraic models,
- (d) optimization with grey/black/nonfactorable models, and
- (e) bilevel nonlinear optimization.

Subsequently, we will present our recent fundamental advances in

- (i) improved convex underestimation approaches that include convex envelope results for multilinear functions, and a piecewise quadratic convex underestimator for twice continuously differentiable functions, and
- (ii) the recently proposed novel generalized alpha-BB framework.

Computational studies will illustrate the potential of these advances.