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Deterministic Global Optimization: Advances and Challenges

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In this presentation, we will provide an overview of the research progress in global optimization. The focus will be on important contributions during the last five years, 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, and (c) optimization with differential-algebraic models. Subsequently, we will present our recent fundamental advances in (i) convex envelope results for multi-linear functions, (ii) a piecewise quadratic convex underestimator for twice continuously differentiable functions, (iii) the generalized alpha-BB framework, and (iv) our recently improved convex underestimation techniques for univariate and multivariate functions. Computational studies will illustrate the potential of these advances.