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*Conservative Surrogate Models for Optimization with the Active Subspace Method*

A way to enforce with high probability nonlinear constraints for optimization using the Active Subspace (AS) method is proposed. The goal of using AS is to lower the dimension of the parametric space of the objective function, reducing effects related to the curse of dimensionality. Generally, this method relies on low-dimensional surrogate models of the objective and the constraints over the AS. Unfortunately, since the surrogate constraints are inexact, this can make the resulting optimal solutions infeasible with respect to the exact constraints. To counter this, an artificial bias is imposed on the training data of the surrogate over the active subspace. Two approaches are proposed to determine the bias: the first one using resampling by bootstrap, and the second one using concentration inequalities. To alleviate the computational cost of bootstrapping, the training data is itself resampled to extract further information about the underlying distribution.