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Constrained Optimization with Low-Rank Tensors and Applications to Problems with PDEs under Uncertainty

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We present Newton-type methods for inequality constrained nonlinear optimization using low-rank tensors and apply them to variational inequalities with several uncertain parameters and to optimal control problems with PDEs under uncertainty. The developed inexact methods are tailored to the usage of low-rank tensor arithmetics, which only offer a limited set of operations and require truncation (rounding) in between. We show that they can solve huge scale optimization problems with trillions of unknowns to a good accuracy.