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A LAGRANGIAN-BASED ADAPTIVE ALGORITHM FOR NONSMOOTH NONLINEAR COMPOSITE OPTIMIZATION

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This talk introduces a novel adaptive augmented Lagrangian based framework for addressing a broad and challenging class of nonsmooth, nonconvex optimization problems with nonlinear composite objective structures. These problems characterized by the composition of nonsmooth, nonconvex functionals with nonlinear mappings are pervasive in modern applications. Yet, these models remain notoriously difficult to solve and fall outside the reach of most existing methods without imposing strong and restrictive structural assumptions.

Our approach introduces an adaptive mechanism to update feasibility-penalizing terms within the augmented Lagrangian framework. This innovation allows to essentially transform our multiplier type method into a simple and practical alternating minimization scheme from a certain iteration onward. Notably, this enables us to remove a key limitation in existing theory: the reliance on surjectivity type assumptions for convergence, an assumption traditionally required to establish convergence in composite settings. We show that our method converges to an ε-critical point with a well defined iteration complexity. Moreover, we prove that any bounded sequence generated by an inexact variant of the method with strictly decreasing tolerances, has limit points that are critical for the original problem. Our approach provides novel results even in the simpler *linear* composite models, in which the surjectivity requirement on the linear operator is a baseline assumption.

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