AN ADAPTIVELY INEXACT FIRST-ORDER METHOD FOR BILEVEL LEARNING

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In various imaging and data science domains, tasks are modeled using variational regularization, which poses challenges in manually selecting regularization parameters, especially when employing regularizers involving a large number of parameters. To tackle this, gradient-based bilevel learning, as a large-scale approach, can be used to learn parameters from data. However, the unattainability of exact function values and gradients with respect to parameters (hypergradients) necessitates reliance on inexact evaluations. State-of-the-art inexact gradient-based methods face difficulties in selecting accuracy sequences and determining appropriate step sizes due to unknown Lipschitz constants of hypergradients.

In this talk, we present our algorithm, the ""Method of Adaptive Inexact Descent (MAID),"" featuring a provably convergent backtracking line search that incorporates inexact function evaluations and hypergradients. This ensures convergence to a stationary point and adaptively determines the required accuracy. Our numerical experiments demonstrate MAID's practical superiority over state-of-the-art methods on an image denoising problem. Importantly, we showcase MAID's robustness across different initial accuracy and step size choices.