A Second-Order Descent Method with Active-Set Prediction for Group-Sparse PDE-Constrained Optimization

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In this talk, I will present a second-order descent algorithm tailored for group-sparse and potentially nonconvex optimization problems arising in PDE-constrained settings. The method combines a novel active-set prediction strategy with second-order information to enhance both efficiency and accuracy. The key idea behind the active-set prediction phase is to interpret the first-order optimality conditions iteratively, using the angle between the current iterate and the descent direction to detect which groups are likely to be active or inactive. This predictive mechanism is then coupled with a generalized Hessian to construct a robust second-order descent direction. I will discuss the theoretical properties of the algorithm, including its ability to rapidly and reliably identify the active set, as well as its global and superlinear local convergence. Finally, I will present numerical results that highlight the method's performance in comparison with existing approaches.

In Special Session 21 on Optimization and Control at the Mathematical Congress of the Americas 2025.

MCA 2025 internal code: SS21-T06