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A Generalized Newton Method for Subgradient Systems

This talk presents a new Newton-type algorithm to solve subdifferential inclusions defined by subgradients of extended-real-valued prox-regular functions. The proposed algorithm is formulated in terms of the second-order subdifferential of such functions that enjoys extensive calculus rules and can be efficiently computed for broad classes of extended-real-valued functions. Based on this and on metric regularity and subregularity properties of subgradient mappings, we establish verifiable conditions ensuring well-posedness of the proposed algorithm and its local superlinear convergence. The obtained results are also new for the class of equations defined by continuously differentiable functions with Lipschitzian derivatives , which is the underlying case of our consideration. The developed algorithm for prox-regular functions is formulated in terms of proximal mappings related to and reduces to Moreau envelopes. Besides numerous illustrative examples and comparison with known algorithms, we present applications of the proposed algorithm to the practically important class of Lasso problems arising in statistics and machine learning. Based on joint work with P.D. Khanh (University of Chile) and V. T. Phat (Wayne State University)