数学与系统科学研究院

计算数学所学术报告

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报告题目：

Optimality, exact penalty and augmented Lagrangian method for a class of non-Lipschitz nonlinear programs

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报告地点：　　数学院南楼五层

514 教室

Abstract:

We consider a class of nonlinear programming problems where the objective function is a sum of a smooth function and a non-Lipschitz function. Many problems in sparse portfolio selection, edge preserving image restoration and signal processing can be modelled in this form. When the objective function is not locally Lipschitz, constraint qualifications are no longer sufficient for Karush-Kuhn-Tucker (KKT) conditions to hold at a local minimizer, let alone ensuring an exact penalization. In this paper, we first extend quasi-normality and relaxed constant positive linear dependence (RCPLD) condition to allow the non-Lipschitzness of the objective function and show that they are sufficient for KKT conditions to be necessary for optimality. Moreover, we derive exact penalization results for the following two special cases. When the non-Lipschitz term in the objective function is the sum of a composite function of a separable lower semi-continuous function with a continuous function and an indicator function of a closed subset, we show that a local minimizer of our problem is also a local minimizer of an exact penalization problem under a local error bound condition for a restricted constraint region and a suitable assumption on the outer separable function. When the non-Lipschitz term is a generally continuous function, we also show that our problem admits an exact penalization under the extended quasi-normality. Finally, we propose an augmented Lagrangian method (AL) for solving this kind of problems in which the augmented Lagrangian subproblems is solved by a non-monotone proximal gradient method. Under the assumption that a feasible point is known, we show that any accumulation point of the sequence generated by our method must be a feasible point. Moreover, if RCPLD holds at such an accumulation point, then it is a KKT point of the original problem. We conduct numerical experiments to compare the performance of our AL method and the interior point (IP) method for solving two sparse portfolio selection models. The numerical results demonstrate that our method is not only comparable to the IP method in terms of solution quality, but also substantially faster than the IP method.

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