On the Complexity of Nonlinear Optimization

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Resumo/Abstract:
Given a (unconstrained or constrained) nonlinear optimization problem and an algorithm designed for solving it, the question is about the maximal number of (function-derivatives) evaluations that are necessary to achieve a given stopping criterion defined by $\epsilon > 0$. Relevant results about this problem will be reviewed. In typical gradient-like and quasi-Newton methods the function-evaluation bound is $O(\epsilon^{(-2)})$, in suitable versions of Newton' s method this complexity improves to $O(\epsilon^{(-3/2)})$. Generalizations of these results for methods that employ high-order approximations of the objective function will be reported, as well as the generalizations of the basic results to cases in which Lipschitz-continuity is relaxed. Finally, recent research on the complexity of Constrained Optimization will be discussed.