A Trust Region Algorithm with a Worst-Case Global Function Evaluation Complexity of $\mathcal{O}(\epsilon^{-3/2})$ for Nonconvex Smooth Optimization

Frank E. Curtis
Lehigh University, United States
frank.e.curtis@gmail.com

We present a trust region algorithm for solving nonconvex optimization problems that, in the worst-case, is able to drive the norm of the gradient of the objective below a prescribed threshold $\epsilon > 0$ after at most $\mathcal{O}(\epsilon^{-3/2})$ function evaluations, gradient evaluations, or iterations. Our work has been inspired by the recently proposed Adaptive Regularisation framework using Cubics (i.e., the ARC algorithm), which attains the same worst-case complexity bound. Our algorithm is modeled after a traditional trust region algorithm, but employs modified step acceptance criteria and a novel trust region updating mechanism that allows it to achieve this desirable property. Importantly, our method also maintains standard global and fast local convergence guarantees.

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