

An optimal algorithm for minimizing convex functions on simple sets

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We begin by defining optimal algorithms for minimizing differentiable convex functions, summarizing the known complexity result for Krylov space methods: these methods reach an absolute precision of $\epsilon > 0$ for the minimum value of a convex quadratic function in $O(1/\sqrt{\epsilon})$ iterations. No algorithm based on accumulated first order information can be better than this, and hence any algorithm achieving this performance is called optimal.

We then describe an algorithm based on Nesterov's and on Auslender and Teboulle's ideas for minimizing a convex Lipschitz continuously differentiable function on a simple convex set (a set into which it is easy to project a vector). The algorithm does not depend on the knowledge of any Lipschitz constant, and it has optimal performance. We describe the algorithm, the main complexity result and some computational experiments.