FISTA is an automatic geometrically optimized algorithm for strongly convex functions

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Abstract: In this work, we are interested in the famous FISTA algorithm. We show that FISTA is an automatic geometrically optimized algorithm for functions satisfying a quadratic growth assumption. This explains why FISTA works better than the standard Forward-Backward algorithm (FB) in such a case, although FISTA is known to have a polynomial asymptotic convergence rate while FB is exponential. We provide a simple rule to tune the α parameter within the FISTA algorithm to reach an ε-solution with an optimal number of iterations. These new results highlight the efficiency of FISTA algorithm, and they rely on new non asymptotic bounds for FISTA.